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Photonuclear Data Index

January 1965 through January 1970

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The Bureau comprises the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Radiation Research, the Center for Computer Sciences and Technology, and the Office for Information Programs.

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> Office of Standard Reference Data—Clearinghouse for Federal Scientific and Technical Information[3]—Office of Technical Information and Publications—Library—Office of Public Information—Office of International Relations.

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[1] Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

[2] Located at Boulder, Colorado 80302.

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UNITED STATES DEPARTMENT OF COMMERCE • Maurice H. Stans, *Secretary*
NATIONAL BUREAU OF STANDARDS • Lewis M. Branscomb, *Director*

Photonuclear Data Index

January 1965 through January 1970

Prepared by
Photonuclear Data Group

Center for Radiation Research
National Bureau of Standards
Washington, D.C.

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Photonuclear Data Group

E. G. Fuller, H. M. Gerstenberg,
and T. M. Collins

This second supplement to National Bureau of Standards Miscellaneous Publication 277 has been combined with the references given in Supplement 1 (October 1967) and issued as a single publication to assist the users of this material. The original publication Miscellaneous Publication 277 is still available and is the original index of the data on File as of January 1, 1965.

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Foreword

The Photonuclear Data Center, a part of the NBS Linac Radiation Division, is one of the many data centers supported by the NBS Office of Standard Reference Data. The Center has as its first objective the maintenance of a current reference file of abstracted data on photonuclear reactions.

This publication, the second in a series of cumulative supplements to the Photonuclear Data Index (NBS Miscellaneous Publication 277, April 1966), covers data published in the field of photonuclear reactions during the period January 1, 1965 through January, 1970. Additional supplements will be issued at intervals of one and one-half to two years. Other future publications of the Center will contain critically evaluated data and will be included in the National Standard Reference Data Series.

The National Standard Reference Data System provides effective access to the quantitative data of physical science, critically evaluated, compiled for convenience, and readily available through a variety of distribution channels. The System was established in 1963 by action of the President's Office of Science and Technology and the Federal Council for Science and Technology, with responsibility to administer the System assigned to NBS. In August 1968 the program received Congressional sanction with the passage of the Standard Reference Data Act.

Lewis M. Branscomb, Director

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PHOTONUCLEAR DATA INDEX
Supplement 2 (1970)

Photonuclear Data Project*

This index, a supplement to NBS Miscellaneous Publication 277, primarily covers data published in the period dated January 1, 1965 through January, 1970. Organized by element and isotope, each entry in the index is for a specific reaction reported in a given reference. Information is given on the type of measurement, excitation energies studied, source type and energies, detector type and angular ranges covered in the measurement.

Key words: Bibliography, data index, elements, isotopes, nuclear physics, photonuclear reactions.

1. Introduction

A detailed description of the Photonuclear Data Index is given in the following paragraphs. This edition of the Supplement, covering data published since January 1, 1965, supersedes the first edition issued in October 1967. It is an index to all the data entered into the Photonuclear Data Center's files since January 1, 1965. This was the cutoff date for entries appearing in the Photonuclear Data Index (National Bureau of Standards Miscellaneous Publication 277, April 1, 1966). It also lists corrections to entries listed in the Photonuclear Data Index where the original entry was in error or gave misleading information. These entries are designated by a letter E at the end of the remarks column.

All of the data entered in the Center's files are published either in regular journals or as rather complete reports as contributions to various international conferences. Ten journals are searched regularly for data. These are listed below along with an indication of the last issue searched for data included in this index. These are the issues that had been received in the National Bureau of Standards Library by February 15, 1970. Nuclear Science Abstracts is used to find papers published in those journals not regularly searched.

Journal	Last Issue
Physical Review, The	Vol. 187
Physical Review Letters	Vol. 24, #6
Nuclear Physics	Vol. A141, #1
Physics Letters	Vol. 31B, #1
JETP Letters	Vol. 10, #11
Soviet J. of Nuclear Physics	Vol. 9, #4
Il Nuovo Cimento	Vol. 64B, #1
Il Nuovo Cimento Letters	Vol. II, #18
J. Physical Society Japan	Vol. 27, #6
Zeitschrift für Physik	Vol. 230
Nuclear Science Abstracts	Vol. 24, #2

2. Scope of the Data Index

The function of this data index is to furnish a means of readily locating experimental data in the field of photonuclear reactions. This index differs from a bibliography in that it supplies quantitative information about the content of a paper. Each entry in the index corresponds to the measurement of a specific photonuclear reaction for a specific nuclide or group of nuclides. An attempt is made to give as complete a description of each measurement as is possible in a single line. The type of measurement is indicated as well as the range of excitation energies covered, the type of detector used and its energy response, and the type of angular distribution data obtained. The object has been to give a description of each measurement that is complete enough to permit an individual looking for specific types of data in the field to locate the pertinent references without having to go through a large number of irrelevant papers as might be the case if only the title of the paper or the reaction studied were listed for each entry.

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* Participants in the photonuclear data project are E. G. Fuller, H. M. Gerstenberg and T. M. Collins.

For the purposes of this index the general criterion as to what constitutes a measurement of photonuclear data is that the measurement must give information on the electromagnetic matrix element between the ground state and excited states of some nucleus. The most common type of reactions are: (γ,γ), (γ,n) (γ,p), (p,γ_0), and (e,e'). Two reactions which fit the matrix element criterion, but which were not included in the compilation because of their rather special nature are heavy particle coulomb excitation and the thermal neutron capture reaction (n,γ_0). The energy region of interest is from 0 to 150 MeV. Most of the experiments are concerned with the excitation energy range 8 to 30 MeV, the region of the giant dipole resonance.

3. Description of the Index

The data index of each element begins with the isotopic abundances for that element and a list of particle thresholds for each isotope. The abundances were taken from a compilation by Gladys Fuller [1]. This reference should be consulted for remarks concerning the accuracy of these values and possible variations with the source of the sample. The reaction thresholds were taken from a list of Q-values computed by J. H. E. Mattauch, W. Thiele, and A. H. Wapstra [2]. The values given in reference 2 have been arbitrarily rounded off to the nearest 0.1 MeV except for those cases where the uncertainties quoted are of the order of 1 MeV. In these cases, thresholds are given to the nearest MeV.

In the index itself eight categories are used to describe a given paper. These are: Reference number, nucleus excited, reaction, type of information, excitation energy range, source type and energy range, detector type, energy and angular range, and remarks.

For each element, entries are grouped under six reaction classes. These are: total absorption cross sections; elastic and inelastic photon scattering; inelastic electron scattering, including coincidence experiments with outgoing reaction products; reactions where a neutron is detected, i.e. (γ,n), (γ,xn), (γ,np), etc.; reactions where protons are detected; reactions where particles of mass greater than one or multiple particles are emitted; inverse capture reactions; and photofission.

4. Description of Entries

4.1. Reference Number (REF)

The reference number is used to cite the full bibliographical reference which is given in the bibliography following the data index. This number is made up of the year and the first two letters of the first author's name, plus an additional serial number. For example, a paper published in 1963 by Galileo might have a reference number 63Ga3.

4.2. Nucleus Excited (NUCLIDE)

The atomic number (Z), chemical symbol, and mass number (A) of the excited nucleus (not necessarily the target nucleus) is given. The mass number is listed only if the isotopic assignment is unambiguous. In general, it was assumed that the mass number was unambiguous if in the target the abundance of a single isotope was $\geq 97\%$.

4.3. Reaction

The following table defines the symbols used under IN,OUT:

$	polarization of the incident or outgoing particle or polarization or alignment of the target
A	alpha particle

D	deuteron
E	electron
E/	inelastically scattered electron
E+	positron
F	fission
G	photon
G/	inelastically scattered photon
HE3	^{3}He
MU-T	total photon absorption
N	neutron
P	proton
T	triton
XN	all neutrons
XP	all protons
SPL	Spallation
XXX or YYY	Reaction products defined in Remarks

The notation E,E/P means the inelastically scattered electron and proton were detected in coincidence in a reaction of the type: $A + e \rightarrow (A - 1) + e' + p$, while E, P means that only the proton was detected.

4.4. Type of Information (RES)

The following catalog of abbreviations applies to the type of result obtained in an experiment:

ABI	absolute integrated cross-section data $\int \sigma dE_\gamma$
ABX	absolute cross-section data
ABY	absolute yield data
FMF	form factor
LFT	excitated state lifetime
NOX	no cross-section data
RLI	relative integrated cross-section data
RLX	relative cross-section data
RLY	relative yield data
SPC	photon or particle energy spectrum

4.5. Excitation Energy Range (EXCIT)

The excitation energy range of the nucleus involved in the gamma-ray transition is given in MeV. For reactions initiated by gamma rays, the excitation energy is taken as the gamma-ray energy; for reactions initiated by particles, the binding energy and kinematic corrections are made. The abbreviation THR stands for threshold.

4.6. Source Type and Energy Range (SOURCE)

The source of incident particles is characterized by the letter C or D indicating that the source was continuous or discrete in energy. The source energy is indicated under MIN-MAX. The usual source of photons is bremsstrahlung which would be marked C. The range of endpoint energies is given.

4.7. Detector Type, Energy, and Angular Range (DETECTOR)

The following abbreviations apply under detector TYPE:

ACT	measurement of radioactivity of the target
BBL	bubble chamber
BF3	BF$_3$ neutron counter with moderator, e.g., Halpern detector, long counter
CCH	cloud chamber
EMU	emulsions (photographic plates)
ION	ionization chamber
MAG	magnetic spectrometer
MGC	magnetic Compton spectrometer
MGP	magnetic pair spectrometer
MOD	moderated neutron detector not employing a BF$_3$ counter, e.g., rhodium foil, Szilard-Chalmers reaction, ^{3}He, ^{6}Li reactions, Gd loaded liquid scintillator, etc.
NAI	NaI(Tl) spectrometer
SCD	semiconductor (solid state) detector
SCI	scintillator detector other than NaI, e.g., CsI, KI, organic (liquid or solid), stilbene, He
SPK	spark chamber
TEL	counter telescope
THR	threshold detector, e.g., ^{29}Si(n,p)^{29}Al
TOF	time-of-flight detector
TRK	tracks of particles or fragments observed in solid materials (glass, mylar, etc.)

The symbols D or I under TYPE mean that the reaction product was detected differentially or integrally in energy. For example, a scintillator (SCI) is usually used differentially (D) while a BF$_3$ detector used with a neutron moderator (BF3) integrates over neutron energy. The range of detected particle angular distribution is shown under ANG with the following designations:

0-180	one number in this column means the measurements were made at this angle only (angle in degrees)
4PI	a 4π geometry was used or a method like radioactivity or a total absorption measurement
DST	an angular distribution was measured

4.8. Remarks

An attempt is made in this column to give additional information that will make the index entry more useful. For example, pertinent energies are more exactly defined, additional information is given on polarization or alignment experiments, residual nuclei are identified, etc. The additional information is selected in a fairly unsystematic way and is limited by the available space. The entries should not be regarded as exhaustive or consistent.

Some of the abbreviations used in this column are:

BREAKS	levels located by "breaks" in the yield curve
CF	compared with
COINC	coincidence
DT BAL	detail balance
G-WIDTH	$\Gamma\gamma$, gamma-ray transition width
J-PI	spin and parity assignments of levels are made
POL	polarization
Q-SQUARE	momentum transfer squared (q^2)
REL	relative
SEP ISOTP	separated isotope used
B(EL)	reduced radiative transition probability
NSA XXXX	XXXX any number. Indicates paper is not in the Data Center files and that index entry was made from the Nuclear Science Abstract number XXXX in the appropriate volume.

5. References

[1] Fuller, Gladys, 1959 Nuclear Data Tables (NUCLEAR DATA PROJECT) - National Academy of Sciences, National Research Council, Washington, D. C.

[2] Mattauch, J. H. E., Thiele, W., and Wapstra, A. H., Nucl. Phys. 67, 32 (1965).

HYDROGEN Z=1

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
1	99.99	*	*	*	*	*	*	*	*
2	1.5(-2)	2.2	2.2	*	*	*	*	*	*
3	*	6.3	8.5	*	*	*	8.5	8.5	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS	
61PE2	1H 2	E,E/	ABX	0- 12	D 41	MAG-D	DST		
64YE2	1H 2	E,E/	ABX	0- 40	D150	MAG-D	135		
66GO1	1H 2	E,E/	ABX	0- 6	D 54, 70	MAG-D 48- 70	180		
66GR2	1H 2	E,E/	ABX	0- 60	D219-447	MAG-D	DST		
66HU1	1H 2	E,E/	FMF	0- 70	D146-475	MAG-D	DST		
67RA1	1H 2	E,E/	ABX	0- 8	D250-370	MAG-D	180		
68KA2	1H 2	E,E/	ABX	2- 4	D 38- 90	MAG 30- 90	155		
65BO1	1H 2	E,E/P	ABX	0-100	D350	MAG-D250-350	DST		
65BO3	1H 2	E,E/P	ABX	50-100	D235-300	MAG-D100-300	DST	P IN COINC	
57BA1	1H 2	G,N	ABY	30-260	C120-260	THR-I 21	DST	REL YLDS, D/C	E
64BE8	1H 2	$ G,N	NOX	THR- 32	C 32	SCI-D	DST	NEUT POLARIZATION	
65JE1	1H 2	$ G,N	NOX	2- 3	D 3	BF3-I	DST	POL NEUT ASYMM	
67BA1	1H 2	$ G,N	NOX	200-400	C999	TEL-D		999=1 GEV	
69SO1	1H 2	G,N	ABX	230-330	C350,450	SPK-D	DST		
57AL1	1H 2	G,P	ABX	50-150	C170,264	TEL-D 20- 75	DST		E
58TA2	1H 2	G,P	ABX	146-238	C146-238	TEL-D 51-166	DST		E
65LI1	1H 2	$ G,P	NOX	75-250	C 75-250	MAG-D	DST	POL PHOTON	
67KO3	1H 2	G,P	ABX	100-420	C500	TEL-D 50-250	DST	N IN COINC	
67TU2	1H 2	G,P	NOX	9	D 9	EMU	DST		
68BU2	1H 2	G,P	ABX	140-400	C400	MAG-D 50-200	DST		
68SM1	1H 2	G,P	ABX	100-320	C210-330	TEL-D 60-180	DST		
69AN1	1H 2	G,P	ABX	THR-342	C222-342	MAG-D	DST		
69KO1	1H 2	$ G,P	NOX	282-405	C500	TEL-D280-420	DST	PROT POLARIZATION	
66GR1	1H 2	N,G	SPC	2	D 1	SCD-D		BINDING ENERGY	
67TU1	1H 2	N,G	ABX	9	D 14	TEL-D 5- 9	0		
66HU2	1H 3	E,E/	FMF	0-160	D250-370	MAG-D130-360	DST		
64JO1	1H 3	E,E/P	ABX	0 16	D550	MAG-D	DST		
65BO2	1H 3	G,N	ABX	6- 11	D 6- 11	BF3-I	DST		
66KO2	1H 3	G,P	SPC	THR- 33	C 33	TEL-D 4- 14	90		
68PF1	1H 3	G,P	ABX	11- 33	C 33	TEL-D 3- 15	90		
66KO2	1H 3	G,D	ABX	THR- 33	C 33	TEL-D 4- 9	90		
68PF1	1H 3	G,D	ABX	18- 31	C 33	TEL-D 4- 8	90		
61CE2	1H 3	N,G	ABX	16	D 14	TEL-D	4PI		
65AJ1	1H 4	N,G	ABX	11	D 14	SCD-D	0	UPPER LIMIT ABX	

HELIUM Z=2

A	ABUND.(1)	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
3	1.4(-4)	7.7	5.5	*	*	*	*	7.7	7.7
4	99.99	20.6	19.8	19.8	20.6	*	28.3	26.1	28.3

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66HU2	2HE3	E,E/	ABX	0-150	D250-670	SCI-D	130-360	DST	
67FR1	2HE3	E,E/	ABX	0- 17	D200	MAG-D		60	
69CH1	2HE3	E,E/	ABX	5- 20	D 57	MAG-D	28- 56	180	
64JO1	2HE3	E,E/P	ABX	0- 12	D550	MAG-D		DST	
64GO4	2HE3	G,N	ABX	5-170	C170	CCH-D		DST	
65FE1	2HE3	G,N	ABX	THR-170	C170	CCH-D		DST	
66GE1	2HE3	G,N	ABX	THR- 30	CTHR- 30	BF3-I		4PI	
66VA3	2HE3	G,N	ABX	THR-170	C170	CCH-D		4PI	
64GO4	2HE3	G,P	ABX	5-170	C170	CCH-D		DST	
65FE1	2HE3	G,P	ABX	THR-170	C170	CCH-D		DST	
66VA3	2HE3	G,P	ABX	THR-170	C170	CCH-D		4PI	
65ST1	2HE3	G,2P	SPC	9- 40	C 40	SCD-D	1- 8	90	
65VA1	2HE3	G,2P	ABX	THR-170	C170	CCH-D		DST	
65ST1	2HE3	G,D	ABX	9- 46	C 40, 55	SCD-D		90	
65VA1	2HE3	G,PD	ABX	THR-170	C170	CCH-D		DST	
55GR1	2HE3	P,G	ABX	5- 8	D 0- 2	NAI-D	4- 8	DST	
62GR1	2HE3	P,G	ABX	5- 7	D 0- 2	NAI-D	2- 7	DST	
66BA2	2HE3	P,G	ABX	110	D156	SCI-D	83-122	DST	
66WO1	2HE3	P,G	ABX	7- 14	D 2- 12	NAI-D	5- 20	DST	
67GE1	2HE3	P,G	ABX	7- 9	D 2- 4	NAI-D		90	
67WO1	2HE3	P,G	ABX	7- 14	D 2- 12	NAI-D	2- 14	DST	
65FR1	2HE4	E,E/	ABX	0- 30	D200	MAG-D	160-175	DST	
68FR1	2HE4	E,E/	ABX	20- 30	D150-400	MAG-D	162-270	DST	
66FE1	2HE4	G,N	ABX	20- 80	C 20- 80	BF3-I		4PI	
68GO2	2HE4	G,N	ABX	THR-260	C260	CCH-D		DST	
68GO5	2HE4	G,N	ABX	26-150	C170,260	CCH	5-130	DST	
69AR3	2HE4	$ G,N	NOX	22- 64	C300	CCH-D		DST	POL OF HE3
69AR4	2HE4	G,N	ABX	21-120	C120	CCH-D		DST	
65AR1	2HE4	G,P	ABX	THR-999	C999	CCH-D		4PI	999=1 GEV
65CL1	2HE4	G,P	ABX	24- 56	C 40- 60	SCD-D	3- 10	90	
67BU1	2HE4	G,P	RLY	THR- 54	C 44, 54	ACT-I		4PI	
67DE3	2HE4	G,P	ABX	24- 50	C 52	TEL-D	3- 13	90	
68GO2	2HE4	G,P	ABX	THR-260	C260	CCH-D		DST	
67GO5	2HE4	G,P	ABX	20-170	C170	CCH-D	1-150	DST	
68GO5	2HE4	G,P	ABX	20-200	C170,260	CCH	2-240	DST	
68MU1	2HE4	G,P	ABX	23- 32	C 28, 33	SCI-D	3- 10	90	
69AR2	2HE4	G,P	ABX	23- 32	C300	CCH-D		4PI	
69AR3	2HE4	$ G,P	NOX	22- 64	C300	CCH-D		DST	POL OF P AND T
69PI2	2HE4	G,P	ABX	180-480	C	TEL-D	160-500	90	P AND D COINC
69SA1	2HE4	G,P	ABX	22- 30	C 32	EMU-D	2- 8	DST	
69AR1	2HE4	G,PN	ABX	26-120	C120	CCH-D		4PI	
60RE2	2HE4	G,XP	NOX	THR-330	C330	CCH-D		4PI	
65AS1	2HE4	G,XP	ABX	78-300	C250,300	TEL-D	58-128	DST	
65AR1	2HE4	G,D	ABY	THR-999	C999	CCH-D		4PI	999=1 GEV
65AS1	2HE4	G,2D	ABX	24-300	C250,300	TEL-D		DST	COINCIDENCE
58BA3	2HE4	G,NP	RLX	150-280	C280	TEL-D	60-180	DST	PAIR SPC, NP COIN

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
63ZU1	2HE4	N,G	ABX	24	D 4	NAI		DST	
65SC1	2HE4	P,G	ABX	20- 23	D 0- 4	NAI-D	20- 24	0	
63ZU1	2HE4	D,G	ABX	24	D 1	NAI		45	1=1.35 MEV
69DE3	2HE4	D,G	ABX	26- 30	D 4- 10	NAI-D	10- 30	130	
69ME1	2HE4	D,G	ABX	26- 34	D 6- 19	NAI-D	20- 36	135	ANG DIST AT 10 MEV

LITHIUM Z=3

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
6	7.42	5.7	4.7	15.8	15.8	1.5	*	3.7	28.7
7	92.58	7.3	10.0	2.5	28.3	2.5	12.9	12.0	29.1

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE	REACTION-	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
68KA1	3LI	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
66MA1	3LI	G,P	SPC	10- 28	C 32	TEL-D	4- 16	90	
66MA1	3LI	G,D	SPC	10- 28	C 32	TEL-D	4- 16	90	
66MA1	3LI	G,T	ABX	10- 28	C 32	TEL-D	4- 16	90	
68BU1	3LI5	D,G	ABX	16- 17	D 0- 1	NAI-D	6- 18	DST	
68KR1	3LI5	D,G	ABX	16- 19	D 2- 6	NAI-D	10- 20	DST	J-PI, 3/2+
68DE2	3LI5	HE,G	ABX	17- 21	D 2- 12	NAI-D	7- 20	90	HE=HE3
66AR2	3LI6	E,E/	LFT	2- 4	D	MAG-D			2=2.18, 4=3.56 MEV
68EI1	3LI6	E,E/	LFT	2, 4	D 30- 58	MAG-D	26- 58	DST	2=2.184, 4=3.562
68HU1	3LI6	E,E/	FMF	4	D 63-127	MAG-D	55-130	DST	
69HU1	3LI6	E,E/	FMF	0- 42	D 55-127	MAG-D		DST	
69NE1	3LI6	E,E/	FMF	2, 3	D109-282	MAG-D	104-285	DST	2=2.184,3=3.562
64CH1	3LI6	E,P	ABX	THR-999	D999	MAG-D	110-450	DST	999=1 GEV
69RA3	3LI6	G,G	LFT	3	C 3	NAI-D		DST	3=3.56 MEV
66CO5	3LI6	G,N	ABX	5- 97	C 5- 97	BF3-I		4PI	
66PA1	3LI6	G,N	SPC	THR- 30	C 30	EMU-D	0- 17	90	
65BA2	3LI6	G,XN	ABX	THR- 60	C 5- 60	BF3-I		4PI	
65BE1	3LI6	G,XN	ABX	6- 32	D 6- 32	BF3-I		4PI	
65HA1	3LI6	G,XN	ABX	THR- 30	C 6- 30	BF3-I		4PI	
60KO5	3LI6	G,P	SPC	6- 28	C 28	EMU-D	1- 20	60	E
64MA3	3LI6	G,P	SPC	THR- 20	C 20	EMU-D	0- 12	DST	
65MA5	3LI6	G,P	SPC	THR- 31	C 31	SCD-D	3-	90	
66MA4	3LI6	G,P	SPC	THR-102	C 95,102	TEL-D	45- 86	DST	
67DE2	3LI6	G,P	ABX	9- 55	C 30- 55	TEL-D	4- 18	90	
68MA1	3LI6	G,P	ABX	100	C 95-102	TEL-D	40- 95	DST	
65BA2	3LI6	G,XP	RLY	THR- 30	C 20, 28	EMU-D	1- 18	DST	
67OD1	3LI6	G,XP	NOX	5- 16	C 16	EMU-D	1- 8	45	16=15.7 MEV
68MU2	3LI6	G,PD	ABX	THR- 32	C 32	EMU-D		4PI	
65DA1	3LI6	G,D	ABY	THR- 4	C 4	SCD-D		90	
65MA5	3LI6	G,D	SPC	THR- 31	C 31	SCD-D	3-	90	
66AL1	3LI6	G,D	ABY	100-700	C200-800	MAG-D		35	
67DE2	3LI6	G,D	ABX	7- 55	C 30- 55	TEL-D	5- 17	90	

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS	
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX			
65BA2	3LI6	G,T	ABX	19- 25	C 35	EMU-D	1- 10	DST		
65MA5	3LI6	G,T	SPC	THR- 31	C 31	SCD-D	3-	90		
66SH1	3LI6	G,T	ABX	19- 24	C 40	SCD-D	1- 13	90		
67DE2	3LI6	G,T	ABX	21- 55	C 30- 55	TEL-D	5- 17	90		
68MU2	3LI6	G,T	ABX	THR- 32	C 32	EMU-D		DST		
68SH2	3LI6	G,T	ABX	24- 35	C 40	MAG-D	8- 19	90		
66NU1	3LI6	HE,G	ABX	16- 25	D 5- 20	NAI-D	10- 25	DST	HE=HE3	
68BL1	3LI6	HE,G	ABX	16- 28	D 0- 11	NAI-I	10- 28	DST	HE=HE3	
65CH1	3LI7	E,E/	ABX	1	D 2- 4	MAG-D	2- 3	162		
66AR2	3LI7	E,E/	LFT	11	D 30- 60	MAG-D		DST	11=11.28 MEV	
69HU1	3LI7	E,E/	FMF	0- 26	D 55-127	MAG-D		DST		
67BA2	3LI7	G,N	ABX	THR- 50	C 7- 50	BF3-I		4PI		
65HA1	3LI7	G,XN	ABX	THR- 30	C 6- 30	BF3-I		4PI		
65WA1	3LI7	G,XN	SPC	THR- 25	C 25	EMU-D	2- 13	90		
69GA1	3LI7	$ G,XN	SPC	2- 85	C 85	CCH-D	1- 14	DST	N POLARIZATION	
67DE1	3LI7	G,P	ABX	14- 50	C 21- 52	TEL-D	4- 17	90		
68MA1	3LI7	G,P	ABX	100	C 95-102	TEL-D	40- 95	DST		
69AN4	3LI7	$ G,P	RLY	320	D320	MAG-D	68	33	COHERENT BREMS	
65AR2	3LI7	G,2P	ABY	THR-999	DTHR-999	ACT-I		4PI	NO H5, 999=1 GEV	
67DE1	3LI7	G,D	ABX	15- 50	C 21- 52	TEL-D	4- 17	90		
55MI1	3LI7	G,T	ABX	6- 21	C 10, 21	EMU-D		4PI		E
61SH6	3LI7	G,T	ABX	5- 9	C 10	EMU-D	1- 4	DST		E
65DA1	3LI7	G,T	ABY	THR- 4	C 4	SCD-D		90		
67DE1	3LI7	G,T	ABX	8- 50	C 21- 52	TEL-D	4- 17	90		
67SM1	3LI7	G,NP	ABX	150-250	C250	TOF-D		DST		

BERYLLIUM Z=4

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
9	100.00	1.7	16.9	17.7	21.2	2.5	20.6	18.9	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS	
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX			
69NA2	4BE7	A,G	ABX	1- 2	D 0- 1	NAI-D	1- 2	90	SOURCE 164-245 KEV	
67BL2	4BE8	P,G	RLX	17- 34	D 1- 18	NAI-D	17- 33	90		
67NI1	4BE8	P,G	RLY	18- 19	D 1- 3	NAI-D	7- 20	DST		
65NG1	4BE9	E,E/	FMF	2- 47	D 50-250	MAG-D	20-250	DST	2.47,6.4 MEV,CONT	
66AR2	4BE9	E,E/	LFT	16	D	MAG-D			16=15.97 MEV	
66CL1	4BE9	E,E/	LFT	14- 17	D 40- 60	MAG-D	36- 40	DST		
67BE1	4BE9	E,E/	FMF	2	D340	MAG-D		DST	2=2.43 MEV	
68VA1	4BE9	E,E/	ABX	0- 26	D 42- 68	MAG-D	30- 70	180		
65AM3	4BE9	E,E/P	RLY	8- 60	D510-590	MAG-D	407	51	100 MEV P COINC	
59BA3	4BE9	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI		E
68BO2	4BE9	E,XXX	RLY	THR-119	D119	MAG-D		76	XXX=MASS SPECTRUM	
65WY1	4BE9	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI		
64LO3	4BE9	G,G	ABX	10- 30	C 10- 30	NAI-D	10- 30	140		
67LO1	4BE9	G,G/	ABX	12- 30	C 34	NAI-D		DST		

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REF     NUCLIDE REACTION RES  EXCIT    SOURCE    DETECTOR    ANG  REMARKS
         Z   A   IN,OUT                MIN-MAX  TYPE MIN-MAX

64K05    4BE9     G,N     RLY  15- 32 C 35      MAG-D  4- 20 DST
66C04    4BE9     G,N     ABI   6- 80 C  6- 80  BF3-I        4PI
66DE3    4BE9     G,N     SPC THR- 85 C 85      CCH-D  0- 15 135
66TH1    4BE9     G,N     SPC THR- 17 C 17      SCI-D  2- 12  90
67BE6    4BE9     G,N     ABX   2-  4 C  2-  4  TOF-D  0-  1 135
68KA1    4BE9     G,N     ABX  50- 85 C 55, 85  TOF-D 10- 85  67 NEUT ENGY SPEC
67GA1    4BE9     G,2N    ABY THR- 23 C 23      ACT-I        4PI
55BA5    4BE9     G,XN    ABY  30-200 C150-250  THR-I 30-    DST                E
64AL5    4BE9     G,XN    NOX THR- 34 C 34      THR-I  6-    DST
65C02    4BE9     G,XN    ABI   6- 80 C  6- 80  BF3-I        4PI
69GA1    4BE9   $ G,XN    SPC   2- 85 C 85      CCH-D  1- 14 DST N POLARIZATION
64K05    4BE9     G,P     ABX  15- 32 C 35      MAG-D  1- 15 DST
65K02    4BE9     G,P     ABX  18- 31 C 35      EMU-D  1- 20 DST
66DE6    4BE9     G,P     ABX THR- 50 C 20- 50  ACT-I        4PI
66DE6    4BE9     G,P     ABX THR- 50 C 20- 50  TEL-D  3- 11  90
66V01    4BE9     G,P     ABX THR- 81 C 21- 81  TEL-D  3-  5  90
57CH1    4BE9     G,XP    SPC THR- 84 C 68, 84  EMU-D 20- 50 DST                E
59CH1    4BE9     G,XP    RLY THR- 80 C 90      TEL-D 15- 60 DST REL D TO P YLD E
62BA1    4BE9     G,D     ABY  40- 60 C 45- 62  ACT-I        4PI
64K05    4BE9     G,D     RLY  15- 32 C 35      MAG-D  4- 14 DST
66DE6    4BE9     G,D     ABX THR- 50 C 20- 50  TEL-D  4- 10  90
66V01    4BE9     G,D     ABX THR- 81 C 21- 81  TEL-D  3-  6  90
59CH1    4BE9     G,XD    RLY THR- 80 C 90      TEL-D 15- 60 DST REL D TO P YLD E
66DE6    4BE9     G,T     ABX THR- 50 C 20- 50  TEL-D  4- 11  90
66V01    4BE9     G,T     ABX THR- 81 C 21- 81  TEL-D  4-  7  90
65LA1    4BE9     P,G     ABX 160     D155      SCD-D  0- 30 DST
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BORON Z=5

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 A    ABUND.(1)          SEPARATION ENERGIES (MEV)
                G,N    G,P    G,T   G,HE3   G,A   G,2N   G,NP   G,2P
 10   19.61     8.4    6.6   18.7   17.8    4.5   27.0    8.3   23.5
 11   80.39    11.5   11.2   11.2   27.2    8.7   19.9   18.1   30.9
  (1) ABUNDANCE DEPENDS ON SOURCE
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REF     NUCLIDE REACTION-RES  EXCIT    SOURCE    DETECTOR    ANG  REMARKS
         Z   A   IN,OUT                MIN-MAX  TYPE MIN-MAX

68KA1    5B       G,N     ABX  50- 85 C 55,85   TOF-D 10- 85  67 NEUT ENGY SPEC
67GA1    5B       G,BE7   RLY THR- 23 C 23      ACT-I        4PI

66PA4    5B  8    P,G     ABX   1-  2 D  1-  2  SCD-D

65FR2    5B 10    E,E/    FMF   6     D100-220  MAG-D 90-220 DST 6=6.02 MEV
65SP1    5B 10    E,E/    FMF   7     D 55      MAG-D 15- 55 DST WIDTH, 7.48 MEV
66K01    5B 10    E,E/    ABX   0- 18 D 50, 60  MAG-D 30- 60 180 8 LEVELS
66SP1    5B 10    E,E/    ABX   6,  7 D 32- 57  MAG-D        DST 6,7=6.01,7.47 MEV
64L03    5B 10    G,G     ABX  10- 30 C 10- 30  NAI-D 10- 30 140
67L01    5B 10    G,G/    ABX  12- 30 C 34      NAI-D        DST
65HA1    5B 10    G,XN    ABX THR- 30 C  6- 30  BF3-I        4PI
68SH6    5B 10    G,P     ABX   6- 13 C 13      EMU-D        DST 13=12.5 MEV
65PA1    5B 10   HE,G     ABX  18- 19    0-  3  NAI-D 10- 30 DST HE=HE3
68LI1    5B 10   HE,G     ABX  21- 27 D  3-  6  NAI-D        DST HE=HE3
66F02    5B 10    A,G     SPC   5-  7 D  1-  3  NAI-D  2-  7  90
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REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
64BR2	5B 11	E,E/	SPC	8- 9	D 54	MAG-D	44- 46	141	
66AR2	5B 11	E,E/	LFT	4, 5	D 30- 60	MAG-D		DST	4=4.46, 5=5.04 MEV
66KO1	5B 11	E,E/	ABX	0- 19	D 50, 60	MAG-D	30- 60	180	7 LEVELS
66RI1	5B 11	E,E/	FMF	2, 4	D	MAG-D		DST	2,4=2.13,4.46 MEV
66SP1	5B 11	E,E/	ABX	2- 9	D 32- 57	MAG-D		DST	2.12,8.56,8.93 MEV
67SP1	5B 11	E,E/	FMF	4, 5	D 35- 57	MAG-D		DST	4,5=4.46,5.04 MEV
64LO3	5B 11	G,G	ABX	10- 30	C 10- 30	NAI-D	10- 30	140	
65KE1	5B 11	G,G	LFT	2	C 5	NAI-D	0- 3	135	2=2.13 MEV
67LO1	5B 11	G,G/	ABX	12- 30	C 34	NAI-D		DST	
65HA1	5B 11	G,XN	ABX	THR- 30	C 6- 30	BF3-I		4PI	
69SO2	5B 11	G,P	ABX	15- 32	C 15- 32	SCD-D	2-	4PI	
69MU2	5B 11	G,NG	SPC	11- 35	C 24, 35	SCD-D	0- 9		GAMMA SPECTRUM
69MU2	5B 11	G,PG	SPC	11- 35	C 24, 35	SCD-D	0- 9		GAMMA SPECTRUM
66NE1	5B 11	G,3P	ABY	45-250	C250	ACT-I		4PI	
61KN1	5B 11	D,G	ABX	16- 18	D 0- 2	THR-I		4PI	
62SU2	5B 11	D,G	RLX	16- 20	D 1- 5	NAI-D		90	
64SU1	5B 11	D,G	ABX	18- 23	D 0- 5	NAI-D		DST	
66SU1	5B 11	D,G	ABX	16- 21	D 1- 6	NAI-D	0- 25	DST	
66ZI1	5B 11	D,G	ABX	16- 18	D 1- 2	NAI-D		DST	
67PA3	5B 11	A,G	ABX	9- 11	D 1- 4	NAI-D	2- 10	90	

CARBON Z=6

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
12	98.89	18.7	16.0	27.4	26.3	7.4	31.8	27.4	27.2
13	1.11	4.9	17.5	23.9	24.4	10.7	23.7	20.9	31.6

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
64BR2	6C 12	E,E/	SPC	0- 20	D 54	MAG-D		141	
66AR2	6C 12	E,E/	LFT	4	D	MAG-D			4=4.43 MEV
66CR1	6C 12	E,E/	FMF	4, 10	D600-800	MAG-D		DST	4,10=4.43,9.6 MEV
66PR1	6C 12	E,E/	NOX	14- 21	D100-200	MAG-D		180	
67AF1	6C 12	E,E/	RLX	0-100	D846	MAG-D		DST	
67BE3	6C 12	E,E/	ABX	4	D113-390	MAG-D	100-400	DST	4=4.43 MEV
67CR1	6C 12	E,E/	FMF	0- 10	D100-200	MAG-D		DST	4.43,7.66,9.4 MEV
67CR2	6C 12	E,E/	FMF	19	D400-800	MAG-D		DST	19=19.5 MEV
67PE1	6C 12	E,E/	LFT	15	D 40- 65	D	20- 60	DST	15=15.1 MEV
68BE6	6C 12	E,E/	FMF	18- 20	D 63-128	MAG-D		DST	19.4 MEV LEVEL
68DE3	6C 12	E,E/	FMF	55-202	D580-968	MAG-D	450-968	DST	
68DR1	6C 12	E,E/	FMF	19	D140	MAG-D		DST	19=19.4 MEV
68PR1	6C 12	E,E/	FMF	14- 21	D100-200	D	80-200	180	6 LEVELS
68RI1	6C 12	E,E/	FMF	26- 35	D 60-100	MAG-D	40- 80	DST	
69BE5	6C 12	E,E/	FMF	20-180	D200-300	MAG-D	180-300	60	
69DE6	6C 12	E,E/	ABX	300	D580-968	MAG-D	450-968	DST	
69TO2	6C 12	E,E/	FMF	11	D183,250	MAG-D	150-250	DST	11=10.8 MEV
69VA1	6C 12	E,E/	ABX	13- 22	D 50- 70	MAG-D	28- 70	180	15.1,19.2 MEV
70LI1	6C 12	E,E/	FMF	22- 37	D 52-102	MAG-D	15-102	DST	RED.MATRIX ELEMNTS
67AM1	6C 12	E,E/P	RLX	130,160	D635	MAG-D		51	
59BA3	6C 12	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI	
65HE1	6C 12	E,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
65HE1	6C 12	E+,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
64CH1	6C 12	E,P	ABX		D999	MAG-D	110-450	DST	999=4 GEV
68BO2	6C 12	E,XXX	RLY	THR-110	D110	MAG-D		76	XXX=MASS SPECTRUM

REF	NUCLIDE Z	A		REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS	
56TZ2	6C	12		G,MU-T	LFT	23	C 22- 23	ACT-I		4PI		E
65WY1	6C	12		G,MU-T	ABX	10- 35	C 90	SCI-D		4PI		
69BE2	6C	12		G,MU-T	ABX	10- 30	C 35	MGC-D	10- 30	4PI		
60BU3	6C	12		G,G	LFT	15	C 23	NAI-D		DST	15=15.1 MEV	
61WI1	6C	12		G,G	ABX	40-120	C132	SCI-D		DST		E
67KU2	6C	12		G,G	LFT	15	D 15	NAI-D	15	135	15=15.1 MEV	
67LO1	6C	12		G,G/	ABX	18- 34	C 34	NAI-D		DST		
55SP2	6C	12		G,N	RLY	THR- 20	C 17- 20	ACT-I		4PI	BREAKS	E
56TZ1	6C	12		G,N	RLY	22- 24	C 22- 24	ACT-I		4PI		E
57BA1	6C	12		G,N	ABY	30-260	C120-260	THR-I	21-	DST		E
59SA1	6C	12		G,N	NOX	19- 21	C 18- 21	MOD-I		4PI	BREAKS	E
59SA1	6C	12		G,N	NOX	THR- 19	C 18- 19	ACT-I		4PI	BREAKS	E
62FI2	6C	12		G,N	RLX	21- 29	C 25- 32	TOF-D	2- 15			
64BE8	6C	12	$	G,N	NOX	THR- 32	C 32	SCI-D		DST	NEUT POLARIZATION	
65VE1	6C	12		G,N	SPC	THR- 33	C 34	TOF-D	1- 14	DST		
66BA4	6C	12		G,N	ABX	THR- 52	C 18- 52	BF3-I		4PI		
66BI1	6C	12		G,N	ABX	20-200	C 20-200	BF3-I	0- 50	4PI		
66CO2	6C	12		G,N	ABX	THR- 65	CTHR- 70	ACT-I		4PI		
66FO1	6C	12		G,N	ABX	18- 70	C 18- 70	ACT-I		4PI		
66FU1	6C	12		G,N	ABX	18- 37	D 18- 37	BF3-I		4PI		
66LO1	6C	12		G,N	ABX	21- 27	D 21- 27	ACT-I		4PI		
66MI2	6C	12		G,N	ABX	18- 26	D 18- 26	BF3-I		4PI		
67AN1	6C	12		G,N	RLY	THR-999	CTHR-999	ACT-I		4PI		
67DI2	6C	12		G,N	ABY	18-999	C300-999	ACT-I		4PI	999=1 GEV	
67DI3	6C	12		G,N	ABX	300-999	C300-999	ACT-I		4PI	999=1 GEV	
67GE2	6C	12		G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI		
67JO1	6C	12		G,N	ABX	19- 20	D 19- 20	ACT-I		4PI		
67TA1	6C	12		G,N	ABI	THR-170	C170	CCH-I		4PI		
68KA1	6C	12		G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC	
68WU1	6C	12		G,N	ABX	THR- 40	C 20- 40	TOF-D	2- 25	90		
69DE1	6C	12		G,N	ABY	THR-999	C 1- 6	ACT-I		4PI	999=5.5 GEV	
69DE4	6C	12		G,N	NOX	19-260	C260	ACT-I		DST	C11 RECOIL DST	
66MA2	6C	12		G,NG/	RLX	21- 31	C 21- 31	NAI-D				
58BA5	6C	12		G,XN	RLY	THR- 23	C 18- 23	BF3-I		4PI	BREAKS	E
64AL5	6C	12		G,XN	NOX	THR- 34	C 34	THR-I	6-	DST		
65BA1	6C	12		G,XN	ABX	THR- 52	C 18- 52	BF3-I		4PI		
65MI1	6C	12		G,XN	ABX	THR- 30	CTHR- 30	BF3-I		4PI		
66FI2	6C	12		G,XN	SPC	THR- 65	C 65	TOF-D	5- 40	90		
67FE2	6C	12		G,XN	ABX	100-150	C150	BF3-I		4PI		
68RA2	6C	12		G,XN	SPC	THR-103	C103	TOF-D	3- 90	DST		
69BA1	6C	12		G,XN	ABX	19- 25	C 19- 25	BF3-I		4PI		
65KI2	6C	12		G,P	ABY	88-720	D400-720	MAG-D	70-100	57		
66KE1	6C	12	$	G,P	ABX	21- 22	D 21- 22	EMU-D		DST		
66PA2	6C	12		G,P	SPC	THR- 55	C 55	SCI-D	34	DST		
67TA1	6C	12		G,P	ABX	THR-170	C170	CCH-I		DST		
68FR2	6C	12		G,P	RLX	THR- 32	C 30, 32	TEL-D		DST		
68MA1	6C	12		G,P	ABX	100	C 95-102	TEL-D	40- 95	DST		
68MA2	6C	12		G,P	RLX	50- 80	C 50- 80	TEL-I	35- 60	45		
69MA3	6C	12		G,P	ABX	36- 80	C 50- 80	TEL-D	20- 70	45		
66MA2	6C	12		G,PG/	RLX	21- 31	C 21- 31	NAI-D				
67TA1	6C	12		G,2P	ABI	THR-170	C170	CCH-I		4PI		
64SE1	6C	12		G,XP	SPC	THR- 24	C 24	EMU-D	2- 8	DST		
68FR3	6C	12		G,XP	RLX	20- 38	C 38	TEL-D	4- 22	90	38=37.7 MEV	
64KI1	6C	12		G,D	ABY	80-800	C400-800	TOF-D	45- 70	57		
65KI2	6C	12		G,D	ABY	70-720	D400-720	MAG-D	40- 70	57		
67KR2	6C	12		G,T	RLX	THR- 55	C 30- 55	ACT-I		4PI		
67TA1	6C	12		G,HE3	ABI	THR-170	C170	CCH-I		4PI		
67DI3	6C	12		G,BE7	ABX	300-999	C300-999	ACT-I		4PI	999=1 GEV	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
64WA1	6C 12	G,3A	ABX	18	D 17	SCI-D		4PI	18=17.6 MEV
65RO1	6C 12	G,3A	ABX	12- 17	C 12- 17	EMU-D		4PI	
67SM1	6C 12	G,NP	ABX	150-250	C250	TOF-D		DST	
67TA1	6C 12	G,NP	ABI	THR-170	C170	CCH-I		4PI	
68TA1	6C 12	G,NP	ABX	THR-170	C170	CCH-I		DST	
68TA1	6C 12	G,NPA	ABX	THR-170	C170	CCH-I		DST	
67TA1	6C 12	G,NHE3	ABI	THR-170	C170	CCH-I		4PI	
68TA1	6C 12	G,NHE3	ABX	THR-170	C170	CCH-I		DST	
67TA1	6C 12	G,NA	ABI	THR-170	C170	CCH-I		4PI	
68TA1	6C 12	G,NA	ABX	THR-170	C170	CCH-I		DST	
69OW2	6C 12	G,NA	ABX	26- 31	C 26- 71	ACT-I		4PI	
68TA1	6C 12	G,PT	ABX	THR-170	C170	CCH-I		DST	
67TA1	6C 12	G,PA	ABI	THR-170	C170	CCH-I		4PI	
68TA1	6C 12	G,PA	ABX	THR-170	C170	CCH-I		DST	
66AR1	6C 12	G,BE7	ABX	30- 57	C 30- 57	ACT-I		4PI	
67DI2	6C 12	G,BE7	ABY	THR-999	C300-999	ACT-I		4PI	999=1 GEV
67TA1	6C 12	G,SPL	ABI	THR-170	C170	CCH-I		4PI	
64MA4	6C 12	G,XXX	ABY	150-720	C150-720	ACT-I		4PI	XXX=C11 FINAL
64HA3	6C 12	P,G	ABX	17- 20	D 1- 4	NAI-I		DST	
65SE1	6C 12	P,G	ABX	16- 20	D 0- 4	NAI-D		DST	
67FE1	6C 12	P,G	ABX	25- 30	D 10- 15	NAI-D		90	
69KE1	6C 12	P,G	ABX	28- 37	D 13- 21	NAI-D	20- 38	DST	
67PE1	6C 13	E,E/	LFT	15	D 40- 65	D	20- 65	DST	15=15.11 MEV
69CA1	6C 13	E,E/	SPC	0- 20	D140	MAG-D	100-140	DST	
69TO1	6C 13	E,E/	FMF	3	D 34- 65	MAG-D	30- 65	DST	3=3.08 MEV
69WI2	6C 13	E,E/	LFT	3- 15	D 36- 65	MAG-D	15- 65	DST	7 LEVELS
69RA3	6C 13	G,G	LFT	3	C 3	NAI-D		DST	3=3.68 MEV
66FU3	6C 13	G,N	RLY	THR- 15	C 5- 15	BF3-I		4PI	NSA 13943 BREAKS

NITROGEN Z=7

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
14	99.63	10.5	7.6	22.7	20.7	11.6	30.6	12.5	25.1
15	0.37	10.8	10.2	14.8	28.3	11.0	21.4	18.4	31.0

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68DI1	7N 13	P,G	LFT	15	D 14- 15	NAI-D	11- 15	DST	15.07 MEV
68RI2	7N 13	P,G	LFT	2	D 1	NAI-D		4PI	2=2.37 MEV
66KO1	7N 14	E,E/	ABX	8- 14	D 50, 60	MAG-D	30- 60	180	5 LEVELS
68CL1	7N 14	E,E/	LFT	8- 12	D 35- 58	MAG-D	20- 60	DST	9.17, 10.43 MEV
69BE2	7N 14	G,MU-T	ABX	10- 30	C 35	MGC-D	10- 30	4PI	
66SW1	7N 14	G,G	LFT	7	D 7	NAI-D		DST	7=7.11 MEV
67LO1	7N 14	G,G/	ABX	18- 32	C 34	NAI-D		DST	
68KA1	7N 14	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
58GR1	7N 14	G,P	LFT	8	D 8	ION-D	0- 2	4PI	
65DE2	7N 14	P,G	LFT	9	D 2	NAI-D		DST	
61KN1	7N 14	D,G	ABX	10- 12	D 0- 2	THR-I		4PI	
68BE1	7N 15	E,E/	LFT	6	D 50- 57	MAG-D	43- 57	DST	6=6.32 MEV
69SI1	7N 15	P,G	ABX	10	D 0- 1	NAI-D	0- 12	DST	SOURCE 250-670 KEV

OXYGEN Z=8

A	ABUND.(1)	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
16	99.76	15.7	12.1	25.0	22.8	7.2	28.9	23.0	22.3
17	3.7(-2)	4.1	13.8	18.6	18.8	6.4	19.8	16.3	25.3
18	.20	8.0	15.9	15.8	25.6	6.2	12.2	21.9	29.0

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE	MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS	
66EV1	80	15	P,G	SPC	5- 9	D	1- 2	NAI-D	1- 10	DST		
67EV1	80	15	P,G	LFT	9- 10	D	1- 3	NAI-D		DST		
61IS1	80	16	E,E/	FMF	0-115	D	90-215	MAG-D		DST		E
65VA4	80	16	E,E/	ABX	10- 30	D	43- 69	MAG-D	35- 70	180		
66AR2	80	16	E,E/	LFT	7, 12	D	30- 60	MAG-D		DST	7=6.92, 12=11.52	
66CR1	80	16	E,E/	FMF	6	D	600-800	MAG-D		DST	6=6.1 MEV	
66ST2	80	16	E,E/	FMF	5- 14	D	60	MAG-D	46- 60	117	6.92,11.52 MEV	
66VA1	80	16	E,E/	FMF	10- 30	D	43- 69	MAG-D	35- 70	180		
67DR1	80	16	E,E/	FMF	19-	D	128-	MAG-D		DST	J-PI, 19.08 MEV	
68DR1	80	16	E,E/	FMF	19, 20	D	140	MAG-D		DST	19=19.1,20=20.5	
69TO2	80	16	E,E/	FMF	7	D	183,250	MAG-D	150-250	DST	7=7.12 MEV	
70BE1	80	16	E,E/	FMF	6- 8	D	51-105	MAG-D	53- 97	DST	6.05,6.13,6.91,7.1	
70KI1	80	16	E,E/	FMF	11- 14	D	40-105	MAG-D	27-105	DST	FMF 11.5-13.1 MEV	
65DO3	80	16	G,MU-T	ABX	13- 22	C		MGC-D		4PI		
65WY1	80	16	G,MU-T	ABX	10- 35	C	90	SCI-D		4PI		
69BE2	80	16	G,MU-T	ABX	10- 30	C	35	MGC-D	10- 30	4PI		
59PA3	80	16	G,G	ABX	17	D	15, 18	NAI-D	17	90		
64LA5	80	16	G,G	RLX	THR- 32	C	24, 32	NAI-D	2- 27	DST		
64LO3	80	16	G,G	ABX	10- 30	C	10- 30	NAI-D	10- 30	140		
65MA1	80	16	G,G/	SPC	19- 30	C	21- 31	NAI-D	4- 8	140		
67LO1	80	16	G,G/	ABX	18- 32	C	34	NAI-D		DST		
68EV1	80	16	G,G	LFT	6, 8	D	6, 8	SCD-D	6- 8		LEVELS 6.92, 7.12	
57BA3	80	16	G,N	ABY	15- 18	C	15- 18	ACT-I		4PI	BREAKS	E
59SA2	80	16	G,N	NOX	THR- 22	C	15- 22	ACT-I		4PI	BREAKS	E
62FI2	80	16	G,N	RLX	18- 29	C	26- 32	TOF-D	2- 15			
64BE8	80	16	$ G,N	NOX	17- 32	C	32	SCI-D	2- 14	DST		
65GR1	80	16	G,N	ABX	THR- 54	C	10- 66	ACT-I		4PI		
65VE1	80	16	G,N	SPC	THR- 33	C	34	TOF-D	1- 14	DST		
66BA5	80	16	G,N	ABX	15- 25	C	15- 25	ACT-I		4PI		
66CO1	80	16	G,N	ABX	THR- 65	C	THR- 70	ACT-I		4PI		
66FI1	80	16	$ G,N	NOX	THR- 70	C	10- 70	TOF-D	2- 8	DST		
66MI2	80	16	G,N	ABX	16- 27	D	16- 27	BF3-I		4PI		
67GE2	80	16	G,N	ABY	THR- 27	C	22, 27	BF3-I		4PI		
68KA1	80	16	G,N	ABX	50- 85	C	55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC	
68WU1	80	16	G,N	ABX	THR- 40	C	20- 40	TOF-D	2- 25	90		
69CO3	80	16	$ G,N	NOX	20- 33	C	30, 60	TOF-D	4- 16	DST	N POLARIZATION	
69KH1	80	16	G,N	ABX	16- 33	C	22- 33	TOF-D	1- 14	98		
69NA1	80	16	G,N	ABX	35- 65	C	35- 65	TOF-D	16- 55	68		
66OW1	80	16	G,NG	RLY	THR- 29	C	20- 29	SCD-D	4- 9	135		
66OW2	80	16	G,NG	RLX	THR- 29	C	20- 29	SCD-D		135		
67BA5	80	16	G,NG	SPC	21- 26	C	26	SCD-D	5- 8	135	G-SPECTRUM	
67MU1	80	16	G,NG	SPC	21- 30	C	28, 30	SCD-D	5- 8	90	G-SPECTRUM	
69MU1	80	16	G,NG	SPC	16- 30	C	21- 30	SCD-D		90	G-SPECTRUM	
69UL1	80	16	G,NG	ABY	THR- 32	C	32	SCD-D	5- 11	120		
66FU2	80	16	G,NG/	RLY	20- 26	D	20- 26	BF3-I		4PI	COINC	
68ME4	80	16	G,2N	ABX	THR-300	C	20-300	ACT-I		4PI		

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS	
	Z	A	IN,OUT			MIN-MAX	TYPE	MIN-MAX			
64BA3	80	16	G,XN	ABX	15- 28	C 15- 28	BF3-I		4PI	O/C YLD=1.7(22MEV)	
64BA5	80	16	G,XN	ABX	15- 28	C 15- 28	BF3-I		4PI		
65CA1	80	16	G,XN	ABX	17- 28	D 17- 28	BF3-I		4PI	BRANCH RATIOS	
65HA1	80	16	G,XN	ABX	THR- 30	C 6- 30	BF3-I		4PI		
66FI2	80	16	G,XN	SPC	THR- 65	C 65	TOF-D	5- 40	90		
67FE2	80	16	G,XN	ABX	100-150	C150	BF3-I		4PI		
67MI2	80	16	G,XN	SPC	THR- 20	C 23- 27	TOF-D	2- 12	100		
65MO1	80	16	G,P	SPC	15- 29	C 22, 40	SCD-D		90	BRANCH RATIOS	
65ST2	80	16	G,P	ABX	14- 16	C 14- 16	SCD-D	2- 4	90		
66DE4	80	16	G,P	ABI	THR- 44	C 21- 44	TEL-D	3- 12	90		
67KO1	80	16	G,P	ABX	THR- 55	C 21- 55	TEL-D	3- 30	90		
67TH1	80	16	G,P	RLX	19- 26	C 20- 26	SCD-D	6- 14	DST		
67TH2	80	16	G,P	RLX	20- 25	C 26	SCD-D	7- 12	135		
67TU3	80	16	G,P	SPC	THR- 22	D 22	EMU-D		DST		
68DE1	80	16	G,P	ABX	16- 55	C 21- 55	TEL-D	4- 30	90		
68ST1	80	16	G,P	SPC	20- 26	C 26	SCD-D	8- 13	DST	26=25.6 MEV	
68TU1	80	16	G,P	SPC	21, 22	D 21, 22	EMU-D		DST	21=21.71,22=22.16	
69BA2	80	16	G,P	ABX	20- 30	C 26, 31	SCD-D	8- 18	DST		
69FR1	80	16	G,P	ABX	12- 33	C 12- 33	SCD-D	8-	DST		
69KE3	80	16	G,P	SPC	16- 26	C 26	SCD-D	4- 14	90		
69SH3	80	16	G,P	RLX	12- 27	C 23, 27	EMU-D	1- 15	DST		
69ST1	80	16	G,P	ABX	21- 33	C 33	SCD-D	10- 20	DST		
66FU2	80	16	G,PG	RLY	20- 26	D 20- 26	BF3-I		4PI	COINC	
66OW1	80	16	G,PG	RLY	THR- 29	C 20- 29	SCD-D	4- 9	135		
66OW2	80	16	G,PG	RLX	THR- 29	C 20- 29	SCD-D		135		
67BA5	80	16	G,PG	SPC	17- 26	C 26	SCD-D	5- 8	135	G-SPECTRUM	
67MU1	80	16	G,PG	SPC	17- 30	C 28, 30	SCD-D	5- 8	90	G-SPECTRUM	
69MU1	80	16	G,PG	SPC	12- 30	C 21- 30	SCD-D		90	G-SPECTRUM	
69UL1	80	16	G,PG	ABY	THR- 32	C 32	SCD-D	5- 11	120		
66VO1	80	16	G,D	ABX	THR- 50	C 20- 50	TEL-D	5- 10	90		
65BU1	80	16	G,T	THR	50	C 50	ACT-I		4PI		
55SC2	80	16	G,T	ABY	THR- 32	C 32	ACT-I		4PI		E
66GO2	80	16	G,T	ABX	THR- 55	CTHR- 55	ACT-I		4PI		
67KR2	80	16	G,T	RLX	THR- 55	C 30- 55	ACT-I		4PI		
64TO3	80	16	G,A	ABX	9- 21	C 22	EMU-D		DST		
65RO1	80	16	G,A	ABX	12- 17	C 12- 17	EMU-D	1- 11	4PI		
65RO2	80	16	G,A	RLY	17	C 17	EMU-D		DST		
64TO3	80	16	G,4A	ABX	9- 21	C 22	EMU-D		DST		
65RO1	80	16	G,4A	ABX	12- 17	C 12- 17	EMU-D		4PI		
65GA1	80	16	G,NP	ABX	250	C300	TEL-D	90-140	DST		
65AR3	80	16	G,BE7	RLY	32- 57	C 57	ACT-I		4PI		
66AR1	80	16	G,BE7	ABX	30- 57	C 30- 57	ACT-I		4PI		
67KR2	80	16	G,C11	RLX	THR- 55	C 30- 55	ACT-I		4PI		
67KR2	80	16	G,N13	RLX	THR- 55	C 30- 55	ACT-I		4PI		
61TA3	80	16	P,G	ABX	12- 26	D 0- 14	NAI-D		90		
64EA1	80	16	P,G	NOX	13- 25	D 1- 13	NAI-D		DST		
67BL2	80	16	P,G	RLX	21- 22	D 9- 12	NAI-D	21- 23	45		
67BL1	80	16	P,G	RLX	20- 30	D 10- 18	NAI-D	20- 30	DST		
67EA1	80	16	P,G	ABX	13- 25	D 1- 14	NAI-D		DST		
62SU2	80	16	D,G	RLX	21- 25	D 1- 5	NAI-D		90		
63SU2	80	16	D,G	ABX	21- 25	D 1- 4	NAI-D		DST		E
64SU1	80	16	D,G	ABX	24- 28	D 1- 5	NAI-D		DST		
66SU1	80	16	D,G	ABX	21- 26	D 1- 6	NAI-D	0- 25	DST		
66PU1	80	16	HE,G	RLX	23- 26	D 1- 5	NAI-D	15- 26	90	HE=HE3	
67SU1	80	16	A,G	RLX	14- 25	D 8- 24	NAI-D		DST		
65VA2	80	18	E,E/	ABX	2- 27	D 69	MAG-D	35- 70	180		
69HO1	80	18	G,XP	ABY	THR- 33	C 24- 33	SCD-D	3- 14	90		

FLUORINE Z=9

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
19	100.00	10.4	8.0	11.7	22.1	4.0	19.6	6.1	23.9

REF	NUCLIDE Z A	REACTION-RES IN,OUT		EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
66DO2	9F 19	G,MU-T	ABX	8- 30	C260	MGP	6- 30	4PI	
69BE2	9F 19	G,MU-T	ABX	10- 30	C 35	MGC-D	10- 30	4PI	
64LO3	9F 19	G,G	ABX	10- 30	C 10- 30	NAI-D	10- 30	140	
67LO1	9F 19	G,G/	ABX	14- 32	C 34	NAI-D		DST	
66DE5	9F 19	G,N	NOX	THR-260	C260	ACT-I		DST	
67BA3	9F 19	G,N	ABX	THR- 25	CTHR- 25	ACT-I		4PI	NSA 35223 BREAKS
55LA1	9F 19	G,P	SPC	10- 17	C 17	EMU-D	2- 6	DST	E
64SE1	9F 19	G,XP	SPC	THR- 24	C 14- 24	EMU-D	2- 15	DST	
68AB1	9F 19	G,XP	SPC	THR- 22	C 22	SCD-D	3- 13	90	
65HA2	9F 19	G,A	SPC	THR- 31	C 31	EMU-D	5- 20	DST	
68ME4	9F 19	G,2NP	ABX	THR-300	C 20-300	ACT-I		4PI	
67BE7	9F 20	N,G	LFT	6- 7	D 0- 1	NAI-D	0- 7	90	SOURCE 27,50 KEV

NEON Z=10

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
20	90.92	16.9	12.8	23.9	21.2	4.7	28.5	23.3	20.8
21	0.26	6.8	13.0	21.6	19.9	7.3	23.6	19.6	23.6
22	8.82	10.4	15.3	21.5	26.3	9.7	17.1	23.4	26.4

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
61CL1	10NE20	G,G	LFT	1- 3	D 1- 3	NAI-D	1- 3	0	1.63,2.62,3.34 MEV
60RE2	10NE20	G,XP	RLY	100-240	C240	CCH-D		4PI	
69HO1	10NE20	G,XP	ABY	THR- 33	C 24- 33	SCI-D	3- 14	90	
66PA3	10NE20	P,G	NOX	18	D 5	SCI-D		DST	
67SE1	10NE20	P,G	ABX	16- 25	D 3- 13	NAI-D		DST	
69HO1	10NE22	G,XP	ABY	THR- 33	C 24- 33	SCI-D	3- 14	90	
68GR1	10NE22	A,G	LFT	12, 13	D 2, 3	NAI-D	8- 13	DST	12,13=11.89,12.28

SODIUM Z=11

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
23	100.00	12.4	8.8	17.4	24.4	10.5	23.5	19.2	24.1

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
65TA1	11NA22	P,G	NOX	7	D 0- 1	NAI-D	0- 8	90	LEVELS, J-PI
66WE1	11NA22	P,G	SPC	9- 10	D 1- 2	NAI-D	1- 10	DST	
65BA4	11NA23	E,E/	ABX	4	D 59	MAG-D	50- 59	180	4=4.431 MEV
65WY1	11NA23	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
61AM1	11NA23	G,G	LFT	1	D	NAI-D		120	1=.438 MEV
64LO3	11NA23	G,G	ABX	10- 30	C 10- 30	NAI-D	10- 30	140	
64ME2	11NA23	G,G	LFT	4	D 4	NAI-D	4	DST	4=4.431 MEV
67LO1	11NA23	G,G/	ABX	15- 30	C 34	NAI-D		DST	
68SH3	11NA23	G,XP	SPC	20- 24	D 20, 24	EMU-D	2- 14	DST	
69HO1	11NA23	G,XP	ABY	THR- 33	C 24- 33	SCI-D	3- 14	90	
67FE3	11NA23	O,G	ABX	23- 29	D 12- 31	NAI-D	20- 30	90	LI7+O16

MAGNESIUM Z=12

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
24	78.70	16.5	11.7	26.7	23.1	9.3	29.9	24.1	20.5
25	10.13	7.3	12.1	23.0	20.1	9.9	23.9	19.1	22.6
26	11.17	11.1	14.1	21.6	26.0	10.6	18.4	23.2	24.8

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
68SA1	12MG	E,E/	FMF	1- 8	D100-260	MAG-D			3 PEAKS 1.4-6.0
64DO2	12MG	G,MU-T	ABX	12- 30	C250	MGP-D	12- 30	4PI	
65DO2	12MG	G,MU-T	ABX	11- 30	C260	MGP-D	10- 30	4PI	
65WY1	12MG	G,MU-T	ABX	10- 70	C 90	SCI-D		4PI	
66DO2	12MG	G,MU-T	ABX	8- 30	C260	MGP-D	6- 30	4PI	
59LA1	12MG	G,G	LFT	10	C 13	NAI-D	0- 12	135	10=10.3 MEV
67LO1	12MG	G,G/	ABX	16- 32	C 34	NAI-D		DST	
64FI2	12MG	G,N	RLY	18- 26	C 27- 32	TOF-D	1- 9		
65MI1	12MG	G,XN	ABX	THR- 30	CTHR- 30	BF3-I		4PI	
66FI2	12MG	G,XN	SPC	THR- 65	C 65	TOF-D	5- 40	90	
65MA4	12MG	G,XP	SPC	THR- 31	C 31	SCD-D	3- 14		
66HO3	12MG	G,A	SPC	THR- 31	C 31	SCD-D	2- 13	130	
66AR2	12MG24	E,E/	LFT	9- 22	D 52	MAG-D		141	5 LEVELS
66TI1	12MG24	E,E/	LFT	7- 15	D 51	MAG-D	36- 51	DST	DST CONST Q
67TI1	12MG24	E,E/	SPC	15- 26	D 45- 54	MAG-D		DST	
68FA1	12MG24	E,E/	LFT	7- 28	D 39, 56	MAG-D	28- 56	180	DETAILS 9.9, 10.7
68TI1	12MG24	E,E/	FMF	1- 12	D 37- 51	MAG-D		DST	TABULAR DATA
58BU1	12MG24	G,G	LFT	1	D 1	SCI-D	1	4PI	1=1.38 MEV
67KU2	12MG24	G,G	LFT	9- 11	D 9- 11	NAI-D	9- 11	135	9.92, 10.66 MEV

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66MI2	12MG24	G,N	ABX	16- 27	D 16- 27	BF3-I		4PI	
68CO1	12MG24	G,N	RLX	THR- 65	C 13- 65	ACT-I		4PI	
68OK2	12MG24	G,N	ABY	THR- 20	C 20	ACT-I		4PI	ISOMERIC YIELD
69AN2	12MG24	G,XN	ABX	THR- 65	C 16- 64	ACT-I		4PI	MEAS TOTAL ACT
66IS1	12MG24	G,P	ABX	THR- 34	C 15 30	EMU-D	2- 14	DST	
64SH6	12MG24	G,F	ABY	THR-100	C100	ACT-I		4PI	
67LE1	12MG24	P,G	ABX	16- 25	D 5- 14	MGP-D	8- 25	90	
68BE3	12MG24	P,G	ABX	16- 24	D 4- 13	NAI-D	16- 24	DST	
68HI1	12MG24	A,G	RLX	11- 14	D 3- 6	NAI-D	7- 16	DST	J-PI,G-WIDTH
69FA2	12MG25	E,E/	ABX	0- 27	D 39, 56	MAG-D	30- 56	180	J-PI, B(ML)
68OK3	12MG25	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
67BE7	12MG25	N,G	LFT	7	D 1	NAI-D	0- 7	90	SOURCE 84 KEV
66TI1	12MG26	E,E/	LFT	7- 15	D 51	MAG-D	36- 51	DST	DST CONST Q
68BE2	12MG26	E,E/	ABX	8- 14	D 39, 56	MAG-D		180	
67KU2	12MG26	G,G	LFT	10-	D	NAI-D	10	135	10=10.07 MEV
69BE3	12MG26	G,N	ABX	11- 13	C 13	TOF-D	0	135	0=10 TO 1200 KEV

ALUMINUM Z=13

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
27	100.00	13.1	8.3	18.2	23.7	10.1	24.4	19.4	22.4

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68MO2	13AL25	P,G	LFT	8	D 6	SCD-I		DST	G-WIDTH
67LO2	13AL27	E,E/	FMF	0- 3	D 90-190	MAG-D	85-190	DST	5 LEVELS .84-3 MEV
59BA3	13AL27	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI	
64CH1	13AL27	E,P	ABX		D999	MAG-D	110-450	DST	999=8 GEV
64DO2	13AL27	G,MU-T	ABX	9- 29	C250	MGP-D	9- 29	4PI	
65WY1	13AL27	G,MU-T	ABX	10- 70	C 90	SCI-D		4PI	
59PA3	13AL27	G,G	ABX	17	D 15, 18	NAI-D	17	90	
64ME2	13AL27	G,G	LFT	4	D 4	NAI-D	4	DST	4=4.403 MEV
65KH1	13AL27	G,G	LFT	2, 3	D 2, 3	NAI-D		DST	2,3=2.21,2.98 MEV
65ME3	13AL27	G,G	LFT	4	D 4	NAI-D		DST	4=4.403 MEV
66HO2	13AL27	G,G	LFT	1	C 1	NAI-D	0- 1	117	1=1.01 MEV
66VA4	13AL27	G,G	ABI	10	D 10	NAI-D	0- 10	80	10=10.1 MEV
68RO1	13AL27	G,G	LFT	3	C 3	NAI-I			2.21,2.98,3.0 MEV
64TH1	13AL27	G,N	ABX	15- 24	C 15- 24	ACT-I		4PI	
65TH2	13AL27	G,N	ABX	13- 24	C 13- 25	ACT-I		4PI	THRESHOLD
66BI1	13AL27	G,N	ABX	20-200	C 20-200	BF3-I	0- 50	4PI	
66FU1	13AL27	G,N	ABX	13- 37	D 13- 37	BF3-I		4PI	
67GE2	13AL27	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
68CO1	13AL27	G,N	RLX	THR- 65	C 13- 65	ACT-I		4PI	
68KA1	13AL27	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
66FU1	13AL27	G,2N	ABX	25- 37	D 25- 37	BF3-I		4PI	
68ME4	13AL27	G,2NP	ABX	THR-300	C 20-300	ACT-I		4PI	
67AN1	13AL27	G,N2P	RLX	THR-999	CTHR-999	ACT-I		4PI	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
64AL5	13AL27	G,XN	NOX	THR- 34	C 34	THR-I	6-	DST	
66FI2	13AL27	G,XN	SPC	THR- 65	C 65	TOF-D	5- 40	90	
67AN2	13AL27	G,XN	ABX	THR- 26	C 13- 26	BF3-I		4PI	
69AN3	13AL27	G,XN	RLX	13- 65	C 13- 65	ACT-I		4PI	
69CO2	13AL27	G,XN	ABX	15- 35	D 15- 35	BF3-I		4PI	
69VE1	13AL27	G,XN	SPC	THR- 33	C 33	TOF-D	0- 14	DST	
66LI1	13AL27	G,P	SPC	THR- 32	C 32	SCI-D	1- 20	90	
64MA2	13AL27	G,XP	SPC	THR- 20	C 20	SCD-D	3- 9		
68AB3	13AL27	G,XP	SPC	THR- 27	C 22, 27	SCD-D	3- 15	90	
65HA2	13AL27	G,A	SPC	THR- 31	C 31	EMU-D	5- 20	DST	
66HO3	13AL27	G,A	SPC	THR- 31	C 31	SCD-D	2- 13	130	
66WE2	13AL27	G,A	ABX	10- 33	C 33-	SCD-D	4- 16	90	
64MA4	13AL27	G,PI+	ABY	150-720	C150-720	ACT-I		4PI	
64MA4	13AL27	G,XXX	ABY	150-720	C150-720	ACT-I		4PI	XXX=NA24 FINAL
64MA4	13AL27	G,YYY	ABY	150-720	C150-720	ACT-I		4PI	YYY=F 18 FINAL
65VA5	13AL27	P,G	SPC	10	D 2	NAI-D	1- 10	DST	
67SH2	13AL27	P,G	LFT	8- 11	D 0- 3	SCD-D	0- 10	DST	
67VA1	13AL27	P,G	NOX	8- 11	D 0- 3	SCD-D	0- 10		
67BE7	13AL28	N,G	LFT	7- 8	D 0- 1	NAI-D	0- 7	90	SOURCE 35,89 KEV

SILICON Z=14

A	ABUND.(1)	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
28	92.21	17.2	11.6	27.5	23.2	10.0	30.5	24.7	19.9
29	4.70	8.5	12.3	24.6	20.6	11.1	25.7	20.1	21.9
30	3.09	10.6	13.5	22.2	24.8	10.7	19.1	23.0	24.0

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68SA2	14SI	E,E/	FMF	1- 13	D114-260	MAG-D	100-260	DST	5 LEVELS 1.78-12.7
65WY1	14SI	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
68BE4	14SI	G,MU-T	ABX	10- 30	C 35	MGC-D	10- 30	4PI	
66FI2	14SI	G,XN	SPC	THR- 60	C 60	TOF-D	5- 40	90	
68GO6	14SI	G,XN	ABX	17- 30	C 17- 30	BF3-I		4PI	
69AN3	14SI	G,XN	RLX	THR- 65	C 16- 65	ACT-I		4PI	
69CO1	14SI	G,XN	ABX	14- 38	C 14- 38	BF3-I		4PI	
65GO1	14SI	G,P	SPC	THR- 27	C 23- 27	SCD-D	3- 11	90	
66LI1	14SI	G,P	SPC	THR- 32	C 21, 32	SCI-D	1- 19	90	
67GO1	14SI	G,P	ABX	THR- 29	C 11- 29	SCD-D	1-	4PI	
65HA2	14SI	G,A	SPC	THR- 31	C 31	EMU-D	5- 20	DST	
67AN1	14SI	G,XXX	RLX	THR-999	CTHR-999	ACT-I		4PI	XXX=NA24
64BR2	14SI28	E,E/	SPC	0- 12	D 41	MAG-D		152	
66AR2	14SI28	E,E/	LFT	5	D	MAG-D			5=4.97 MEV
66LI2	14SI28	E,E/	LFT	2- 12	D 30- 56	MAG-D		DST	4 LEVELS
67SA1	14SI28	E,E/	FMF	1- 10	D100-260	MAG-D		DST	4 LEVELS
68AF1	14SI28	E,E/	FMF	10- 30	D150-225	MAG-D	120-225	DST	B(EL)
68DR1	14SI28	E,E/	FMF	11	D140	MAG-D		DST	11=11.4 MEV
68GU1	14SI28	E,E/	ABX	10- 30	D150-225	MAG-D	100-225	DST	
69FA1	14SI28	E,E/	ABX	9- 16	D 39, 56	MAG-D	30- 56	180	J-PI, B(ML)

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
65SW1	14SI28	G,G	LFT	7	D 7	NAI-D		DST	J 7=6.88 MEV
67BE5	14SI28	G,G	LFT	2	D 2	NAI-D		120	2=1.78 MEV
67KU2	14SI28	G,G	LFT	12	D 11- 13	NAI-D	11- 13	135	12=11.42 MEV
67L01	14SI28	G,G/	ABX	15- 32	C 34	NAI-D		DST	
66G03	14SI28	G,N	ABX	17- 30	C 17- 30	BF3-I		4PI	
68C01	14SI28	G,N	RLX	THR- 65	C 13- 65	ACT-I		4PI	
64UL3	14SI28	G,P	SPC	13- 23	C 24	SCD-D	1- 11	4PI	
65BI1	14SI28	G,P	RLX	18	D 18	SCD-D	4- 8	4PI	
65CA2	14SI28	G,P	ABX	THR- 23	C 16- 23	SCD-D	3- 12	4PI	
65MA6	14SI28	G,P	ABX	17- 22	D 17- 22	SCD-D	4- 12	4PI	
65BI1	14SI28	G,A	RLX	18	D 18	SCD-D	6- 8	4PI	
65CA2	14SI28	G,A	ABX	THR- 23	C 16- 23	SCD-D	3- 12	4PI	
65MA6	14SI28	G,A	ABX	17- 22	D 17- 22	SCD-D	4- 12	4PI	
68ME1	14SI28	G,A	ABX	15- 22	D 5- 14	NAI-D	10- 22	DST	
61GA1	14SI28	P,G	ABX	16- 25	D 5- 13	NAI-D		90	
65PA2	14SI28	P,G	ABX	19- 22	D 8- 11	NAI-D	8- 25	90	
65SI1	14SI28	P,G	ABX	16- 24	D 4- 13	NAI-D	16- 24	90	
64RE1	14SI29	G,G	LFT	1	D 1	NAI-D	1	90	1=1.277 MEV
680K3	14SI29	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
680K3	14SI30	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
68ME1	14SI30	G,A	ABX	14- 22	D 4- 14	NAI-D	10- 22	DST	
68ME1	14SI32	G,A	ABX	13- 18	D 7- 12	NAI-D	10- 18	DST	

PHOSPHORUS Z=15

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
31	100.00	12.3	7.3	17.9	22.5	9.7	23.6	17.9	20.8

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66Y01	15P 29	P,G	SPC	8- 9	D 5- 6	ACT-I		4PI	
65K01	15P 31	E,E/	FMF	1- 6	D130-180	MAG-D	120-180	DST	8 LEVELS
66H02	15P 31	G,G	LFT	1	C 1	NAI-D	0- 1	117	1=1.26 MEV
68CR1	15P 31	G,G	LFT	3	C 3	ANI-D	0- 3	135	3=3.13 MEV
68H01	15P 31	G,G	LFT	7- 8	D 7- 8	NAI-D	6- 8	0	7,8=7.90,8.201 MEV
68R01	15P 31	G,G	LFT	3	C 3	NAI-I			SELF-ABSORPTION
69RA3	15P 31	G,G	LFT	3	C 3	NAI-D		DST	3=3.51 MEV
57BA3	15P 31	G,N	ABY	11- 14	C 11- 14	ACT-I		4PI	BREAKS E
67GE2	15P 31	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67MI2	15P 31	G,XN	SPC	THR- 20	C 23- 27	TOF-D	2- 12	100	
66IS2	15P 31	G,P	SPC	THR- 34	C 18, 34	EMU-D	2- 16	30	
68AB4	15P 31	G,XP	SPC	THR- 27	C 22, 27	SCD-D	3- 16	90	
68SH3	15P 31	G,XP	SPC	THR- 19	D 19	EMU-D	2- 14	DST	
66VA2	15P 31	P,G	SPC	8- 10	D 1- 2	NAI-D	1- 11	DST	
67B01	15P 31	P,G	NOX	9- 10	D 2- 3	NAI-D	1- 10	55	
68W01	15P 31	P,G	SPC	0- 9	D 1- 2	SCD-D	0- 9	90	
69WI1	15P 31	P,G	LFT	10- 11	D 3- 4	NAI-I	0- 11	55	G-G CORRELATION

SULPHUR Z=16

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
32	95.0	15.1	9.0	24.0	19.1	6.9	28.1	21.2	16.1
33	0.76	8.6	9.6	21.3	17.1	7.1	23.7	17.5	18.2
34	4.22	11.4	10.9	20.4	21.9	7.9	20.1	21.0	20.3
36	1.4(-2)	9.9	*	19.3	*	8.9	16.9	21.2	*

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE Z	A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
65WY1	16S		G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
68DO1	16S		G,MU-T	ABX	10- 30	C260	MGP-D	10- 30	4PI	
68KA1	16S		G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
68GO6	16S		G,XN	ABX	14- 30	C 14- 30	BF3-I		4PI	
66LI1	16S		G,P	SPC	THR- 32	C 32	SCI-D	1- 20	90	
67IS1	16S		G,P	ABX	THR- 35	C 22- 35	EMU-D	3	DST	
68AB5	16S		G,XP	SPC	THR- 24	C 21- 24	SCD-D	2- 14	90	
69AB1	16S		G,XP	SPC	THR- 26	C 26	SCD-D	2- 14	90	
55RI1	16S		G,D	RLY	THR- 65	C 65	CCH-I		4PI	RLY TO PROTONS E
66HO3	16S		G,A	SPC	THR- 31	C 31	SCD-D	3- 13	130	
65AM2	16S	32	E,E/P	RLY	0-120	D500-630	MAG-D	408	51	100 MEV P COINC
67LO1	16S	32	G,G/	ABX	14- 32	C 34	NAI-D		DST	
62FI3	16S	32	G,N	RLY	16- 28	C 32	TOF-D	1- 12		
62MI5	16S	32	G,N	SPC	15- 30	C 30	EMU-D	0- 15	DST	
65TH1	16S	32	G,N	ABX	THR- 22	C 15- 22	ACT-I		4PI	
66BI1	16S	32	G,N	ABX	20-200	C 20-200	BF3-I	0- 50	4PI	
67WE1	16S	32	G,N	ABX	THR- 32	C 20- 32	ACT-I		4PI	
67WE2	16S	32	G,N	ABX	20- 32	C 20- 32	ACT-I		4PI	
68CO1	16S	32	G,N	RLX	THR- 65	C 13- 65	ACT-I		4PI	
67AN2	16S	32	G,XN	ABX	THR- 26	C 13- 26	BF3-I		4PI	
68SH3	16S	32	G,XP	SPC	17- 20	D 17, 20	EMU-D	2- 14	DST	
65VA3	16S	32	G,NP	ABX	50-300	C 50-300	ACT-I		4PI	
65DE1	16S	32	P,G	ABX	10- 21	D 2- 12	NAI-D	10- 22	DST	
66HO1	16S	32	P,G	SPC	10	D 1	NAI-D	1- 10	55	
69MA5	16S	32	P,G	ABX	18- 21	D 9- 12	NAI-D	15- 25	DST	
69PI1	16S	32	P,G	LFT	4- 11	D 1- 2	SCD-D	0- 10	DST	
67BE7	16S	33	N,G	LFT	8- 9	D 0- 1	NAI-D	0- 7	90	SOURCE 30,111 KEV
65MC2	16S	34	A,G	RLY	11- 12	D 3- 4	NAI-D	0- 12	DST	
67WI1	16S	34	A,G	LFT	11- 12	D 4- 5	NAI-D	1- 12	DST	
66KO4	16S	36	P,G	NOX	10- 11	D 1- 2	NAI-I	7-	DST	SPINS

CHLORINE Z=17

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
35	75.53	12.6	6.4	18.0	19.6	7.0	24.1	17.8	17.3
37	24.47	10.3	8.4	16.8	21.9	7.9	18.9	18.3	*

REF	NUCLIDE	REACTION	RES	EXCIT		SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
66BE3	17CL	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
66HO2	17CL35	G,G	LFT	1	C	1	NAI-D	0- 1	117	1=1.22 MEV
57BA3	17CL35	G,N	RLY	12- 14	C	12- 14	ACT-I		4PI	BREAKS E
67KO2	17CL35	P,G	LFT	8	D	2	NAI-D		DST	J-PI
67WA1	17CL35	P,G	LFT	8	D	2-	SCD-D		4PI	
67BE7	17CL36	N,G	LFT	8- 9	D	0- 1	NAI-D	0- 7	90	SOURCE 25,50 KEV

ARGON Z=18

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
36	0.34	15.3	8.5	24.2	18.6	6.6	28.3	21.2	14.9
38	6.3(-2)	11.8	10.2	20.7	20.8	7.2	20.6	20.6	18.6
40	99.6	9.9	12.5	18.2	23.0	6.8	16.4	20.6	22.8

REF	NUCLIDE	REACTION	RES	EXCIT		SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
69HO1	18AR36	G,XP	ABY	THR- 33	C	24- 33	SCI-D	3- 14	90	
67ME3	18AR36	P,G	RLX	12- 19	D	4- 12	NAI-D	10- 20	DST	
65EH1	18AR38	G,N	ABY	THR- 31	C	18- 31	ACT-I		4PI	
65RE1	18AR40	G,P	ABX	9	D	9	CCH-D	1- 6	4PI	
69HO1	18AR40	G,XP	ABY	THR- 33	C	24- 33	SCI-D	3- 14	90	
65RE1	18AR40	G,A	ABX	9	D	9	CCH-D	1- 12	4PI	
66WE2	18AR40	G,A	ABX	7- 33	C	33	SCD-D	4- 16	90	
65EH1	18AR40	G,NP	ABY	THR- 31	C	18- 31	ACT-I		4PI	

POTASSIUM Z=19

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
39	93.10	13.1	6.4	18.5	19.2	7.2	25.1	18.2	16.6
40	1.2(-2)	7.8	7.6	17.5	16.7	6.4	20.9	14.2	18.3
41	6.88	10.1	7.8	15.8	20.7	6.2	17.9	17.7	20.3

REF	NUCLIDE	REACTION-	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE MIN-MAX		
67G02	19K 37	P,G	LFT	1- 18	D 0- 6	SCD-D 0- 6	DST	J-PI
65C01	19K 38	G,N	ABX	THR- 70	C 12- 70	ACT-I	4PI	
67L01	19K 39	G,G/	ABX	14- 32	C 34	NAI-D	DST	
65C03	19K 39	G,N	ABX	THR- 80	C 80	ACT-I	4PI	
69WE1	19K 39	G,N	RLX	13- 29	C 13- 29	ACT-I	4PI	TO 123 KEV ISOMER
65C03	19K 39	G,NP	ABX	THR- 80	C 80	ACT-I	4PI	
69H01	19K 39	G,XP	ABY	THR- 33	C 24- 33	SCI-D 3- 14	90	

CALCIUM Z=20

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
40	96.97	15.7	8.3	25.0	18.8	7.0	29.3	21.5	14.7
42	0.64	11.5	10.3	19.7	20.2	6.2	19.8	20.4	18.1
43	0.15	7.9	10.7	19.8	18.3	7.6	19.4	18.2	19.9
44	2.06	11.1	12.2	20.9	23.3	8.8	19.1	21.8	21.6
46	3.3(-3)	10.4	13.8	21.5	*	11.1	17.8	23.2	*
48	0.19	9.9	15.3	22.5	*	*	17.2	24.	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE MIN-MAX		
62BL1	20CA40	E,E/	FMF	0- 9	D120-220	MAG-D170-180	DST	7 LEVELS
65CR1	20CA40	E,E/	ABX	3- 5	D250	MAG-D	DST	SUM 4 LEVELS
66AR2	20CA40	E,E/	LFT	7	D	MAG-D		7=6.89 MEV
68ZI2	20CA40	E,E/	ABX	2- 25	D283	MAG-D257-283	88	
66AM1	20CA40	E,E/P	SPC	0-120	D560-760	MAG-D446-479	51	
65D01	20CA40	G,MU-T	ABX	10- 28	C260	MGP 10- 28	4PI	
65WY1	20CA40	G,MU-T	ABX	10- 70	C 90	SCI-D	4PI	
66D02	20CA40	G,MU-T	ABX	8- 30	C260	MGP 6- 30	4PI	
68BE4	20CA40	G,MU-T	ABX	10- 30	C 35	MGC-D 10- 30	4PI	
68ME2	20CA40	G,G	LFT	7	D 7	SCD-D	DST	J-PI 6.91,6.95 MEV
67L01	20CA40	G,G/	ABX	14- 30	C 34	NAI-D	DST	
62FI3	20CA40	G,N	RLY	16- 28	C 32	TOF-D 1- 12		
66BA1	20CA40	G,N	ABX	15- 50	C 15- 50	BF3-I	4PI	
66MI2	20CA40	G,N	ABX	15- 26	D 15- 26	BF3-I	4PI	
67GE2	20CA40	G,N	ABY	THR- 27	C 22, 27	BF3-I	4PI	
67G03	20CA40	G,N	ABX	15- 30	C 15- 30	BF3-I	4PI	
69WU1	20CA40	G,N	ABX	17- 24	D 15- 24	TOF-D 2- 9	90	
69UL1	20CA40	G,NG	ABY	THR- 32	C 32	SCD-D 2- 7	120	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66AN1	20CA40	G,XN	ABX	16- 62	C 16- 62	ACT-I		4PI	
66FI2	20CA40	G,XN	SPC	THR- 65	C 65	TOF-D	5- 40	90	
67FE2	20CA40	G,XN	ABX	100-150	C150	BF3-I		4PI	
67MI2	20CA40	G,XN	SPC	THR- 20	C 23- 27	TOF-D	2- 12	100	
68GO6	20CA40	G,XN	ABX	15- 30	C 15- 30	BF3-I		4PI	
59KO2	20CA40	G,P	SPC	THR- 85	C 85	EMU-D	1- 15	DST	E
64IS3	20CA40	G,P	ABX	THR- 34	C 18- 34	EMU-D	3- 15	DST	
65IS1	20CA40	G,P	SPC	THR- 25	C 18- 25	EMU-D	2- 16	DST	
67DR2	20CA40	G,P	SPC	THR- 19	C 16- 19	EMU-D		DST	
67GO4	20CA40	G,P	ABX	THR- 30	C 12- 30	SCD-D			
68GO1	20CA40	G,P	ABX	THR- 30	C 12- 30	SCD-D			
69WU1	20CA40	G,P	ABX	17- 24	D 15- 24	SCD-D	8- 15	90	
69UL1	20CA40	G,PG	ABY	THR- 32	C 32	SCD-D	2- 7	120	
68SH3	20CA40	G,XP	SPC	THR- 20	D 20	EMU-D	2- 14	DST	
65VA3	20CA40	G,NP	ABI	50-300	C 50-300	ACT-I		4PI	
67SM1	20CA40	G,NP	ABX	150-250	C250	TOF-D		DST	
61TA2	20CA40	P,G	RLY	18- 22	D 9- 15	NAI-D	10- 25	100	
66LE1	20CA40	P,G	SPC	9- 11	D 1- 3	NAI-D	2- 12	55	
67FE1	20CA40	P,G	ABX	18- 23	D 10- 15	NAI-D		90	
68BA1	20CA40	P,G	RLX	11- 14	D 3- 6	NAI-D	8- 14	0	3=2.88,6=6.03 MEV
66ME3	20CA42	G,G	LFT	2	D 2	NAI-D	2-		2=1.52 MEV
68OK3	20CA44	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
68ZI2	20CA48	E,E/	ABX	2- 25	D283	MAG-D	257-283	88	

SCANDIUM Z=21

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
45	100.00	11.3	6.9	17.5	21.0	7.9	21.0	18.1	19.1

REF	NUCLIDE Z A	REACTION-RES IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66TA1	21SC45	G,N	RLY	THR- 48	C 24- 48	ACT-I		4PI	
66WA1	21SC45	G,N	RLY	THR-300	C 50-300	ACT-I		4PI	ISOMER RATIO SC44
67BE8	21SC45	G,N	ABY	11- 48	C 48	ACT-I		4PI	
67BE8	21SC45	G,2N	ABY	21- 48	C 48	ACT-I		4PI	
67BE8	21SC45	G,2P	ABY	19- 48	C 48	ACT-I		4PI	
66DU2	21SC49	P,G	SPC	10- 11	D 1	NAI-D	1- 12	DST	
67CH1	21SC49	P,G	LFT	12	D 2	SCD-D		90	

TITANIUM Z=22

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
46	7.93	13.1	10.4	22.9	20.7	8.0	22.6	21.7	17.2
47	7.28	8.9	10.5	22.0	18.4	9.0	22.1	19.3	18.7
48	73.94	11.6	11.4	22.4	22.6	9.4	20.5	22.1	19.9
49	5.51	8.1	11.3	21.8	20.4	10.1	19.8	19.6	20.8
50	5.34	10.9	12.2	22.0	24.0	10.7	19.1	22.3	21.8

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	22TI	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
64AL5	22TI	G,XN	NOX	THR- 34	C	34	THR-I	6-	DST	
67CO1	22TI	G,XN	ABX	12- 24	C	24	BF3-I		4PI	
69OK1	22TI	G,P	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
69OK1	22TI	G,SC44	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
69OK1	22TI	G,TI45	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
69OK1	22TI	G,CA47	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
66TA1	22TI46	G,NP	RLY	THR- 48	C	24- 48	ACT-I	0- 1	4PI	
67PA2	22TI47	G,NP	RLY	THR- 30	C	22, 30	ACT-I		4PI	
67PA2	22TI47	G,P	RLY	THR- 30	C	22, 30	ACT-I		4PI	
68OK3	22TI47	G,P	ABY	THR- 20	C	20	ACT-I		4PI	
69OK1	22TI47	G,P	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
68OK3	22TI48	G,P	ABY	THR- 20	C	20	ACT-I		4PI	
67PA2	22TI48	G,P	RLY	THR- 30	C	22, 30	ACT-I		4PI	
69OK1	22TI48	G,P	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
67PA2	22TI48	G,NP	RLY	THR- 30	C	22, 30	ACT-I		4PI	
67PA2	22TI49	G,NP	RLY	THR- 30	C	22, 30	ACT-I		4PI	
67PA2	22TI49	G,P	RLY	THR- 30	C	22, 30	ACT-I		4PI	
68OK3	22TI49	G,P	ABY	THR- 20	C	20	ACT-I		4PI	
69OK1	22TI49	G,P	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
67PA2	22TI50	G,NP	RLY	THR- 30	C	22, 30	ACT-I		4PI	
67PA2	22TI50	G,P	RLY	THR- 30	C	22, 30	ACT-I		4PI	

VANADIUM Z=23

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	0.24	9.3	7.9	19.2	19.8	9.9	20.9	16.1	19.3
51	99.76	11.0	8.1	18.7	22.6	10.3	20.4	19.0	20.2

REF	NUCLIDE	REACTION	RES	EXCIT		SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
68FO1	23V 49	P,G	LFT	8	D	1	SCD-D	0- 8	DST	ANALOG STATES
68JU1	23V 51	G,N	NOX	THR- 32	C	32	THR-I	5-	DST	
67BE8	23V 51	G,2N	ABY	20- 37	C	25- 37	ACT-I		4PI	
67BE8	23V 51	G,3N		30- 37	C	37	ACT-I		4PI	
69OK1	23V 51	G,3N	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
68GA1	23V 51	$ G,XN	SPC	THR- 85	C	85	CCH	1- 15	135	NEUT POLARIZATION
69AB2	23V 51	G,XP	SPC	8- 27	C	27	SCD-D	3- 15	90	
67BE8	23V 51	G,NA	ABY	21- 37	C	25- 37	ACT-I		4PI	
67BE8	23V 51	G,2P	ABY	20- 37	C	25- 37	ACT-I		4PI	
67BE8	23V 51	G,A	ABY	10- 37	C	25- 37	ACT-I		4PI	
68ME4	23V 51	G,A	ABX	THR-300	C	20-300	ACT-I		4PI	
68OK1	23V 51	G,A	ABY	THR- 20	C	20	ACT-I		4PI	
68ME4	23V 51	G,A3N	ABX	THR-300	C	20-300	ACT-I		4PI	
69OK1	23V 51	G,SC46	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
69OK1	23V 51	G,SC47	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)
69OK1	23V 51	G,SC48	RLY	THR- 60	C	30- 60	NAI-D		4PI	YLD REL 12C(G,N)

CHROMIUM Z=24

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
50	4.31	12.9	9.6	23.2	20.3	8.6	23.3	21.2	16.3
52	83.76	12.0	10.5	22.4	21.8	9.4	21.3	21.6	18.6
53	9.55	7.9	11.1	21.0	18.8	9.1	20.0	18.5	20.1
54	2.38	9.7	12.	19.7	22.1	7.9	17.6	20.9	22.

REF	NUCLIDE	REACTION	RES	EXCIT		SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
64CO3	24CR	G,N	ABI	THR- 80	C	10- 80	BF3-I		4PI	
68JU1	24CR	G,N	NOX	THR- 22	C	22	THR-I	5-	DST	
64AL5	24CR	G,XN	NOX	THR- 34	C	34	THR-I	6-	DST	
68MC1	24CR	G,XN	SPC	THR- 32	C	22- 32	THR-I	5-	DST	
68OK3	24CR53	G,P	ABY	THR- 20	C	20	ACT-I		4PI	

MANGANESE Z=25

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
55	100.00	10.2	8.1	17.2	21.2	7.9	19.2	17.8	20.

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
67ER1	25MN51	P,G	NOX	6- 7	P 1- 2	SCD-D	1- 7	DST	
66VU1	25MN53	P,G	RLY	7- 9	D 1- 2	NAI-D	4- 9	90	
69TH1	25MN55	E,E/	ABX	0- 4	D 51- 61	MAG-D	47- 61	DST	B(EL)
69DO1	25MN55	G,MU-T	ABX	10- 30	C 10-260	MAG-D	10- 28	4PI	
68AL1	25MN55	G,G	LFT	0- 3	C 4	SCD-D	0- 3	130	7 LEVELS
67LO1	25MN55	G,G/	ABX	14- 32	C 34	NAI-D		DST	
64CO3	25MN55	G,N	ABI	THR- 80	C 10- 80	BF3-I		4PI	
68JU1	25MN55	G,N	NOX	THR- 22	C 22	THR-I	5-	DST	
69DE1	25MN55	G,N	ABY	THR-999	C 2- 6	ACT-I		4PI	999=5.5 GEV
66WA1	25MN55	G,3N	RLY	THR-300	C100-300	ACT-I		4PI	ISOMER RATIO MN52
69DE1	25MN55	G,3N	ABY	THR-999	C 2- 6	ACT-I		4PI	999=5.5 GEV
68GA1	25MN55	$ G,XN	SPC	THR- 85	C 85	CCH-D	1- 15	135	NEUT POLARIZATION
68SH3	25MN55	G,XP	ABX	THR- 23	C 13- 23	SCI-I		DST	SPECTRA ALSO GIVEN
66WA1	25MN55	G,7N4P	RLY	THR-300	C100-300	ACT-I		4PI	ISOMER RATIO SC44

IRON Z=26

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
54	5.82	13.6	8.9	22.9	19.7	8.4	24.1	20.9	15.4
56	91.66	11.2	10.2	20.9	20.3	7.6	20.5	20.4	18.3
57	2.19	7.6	10.6	19.6	18.2	7.3	18.8	17.9	19.6
58	0.33	10.0	12.0	19.4	22.0	7.6	17.7	20.6	21.4

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
69DO2	26FE	G,MU-T	ABX	10- 27	CTHR-260	MGP-D	10- 27	4PI	
64CO3	26FE	G,N	ABI	THR- 80	C 10- 80	BF3-I		4PI	
67BO2	26FE	G,N	ABX	12	C 12, 13	TOF-D	0- 1	135	J-PI
68KA1	26FE	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
67CO2	26FE	G,XN	ABX	THR- 24	C 11- 24	BF3-I		4PI	
66WA1	26FE	G,XNP	RLY	THR-250	C100-250	ACT-I		4PI	ISOMER RATIO MN52
66WA1	26FE	G,XN5P	RLY	THR-250	C100-250	ACT-I		4PI	ISOMER RATIO SC44
67FU1	26FE	G,F	ABY	THR-999	D999	ACT-I		4PI	999=3 GEV
66BE1	26FE	N,G	SPC	15	D 7	NAI-D	8- 18		
67LO1	26FE56	G,G/	ABX	14- 32	C 34	NAI-D		DST	
66BE4	26FE56	G,N	ABX	11	C 13	TOF-D		135	
68OK3	26FE56	G,NP	ABY	THR- 20	C 20	ACT-I		4PI	
68SH3	26FE56	G,XP	ABX	THR- 23	C 13- 23	SCI-I		DST	SPECTRA ALSO GIVEN
68OK3	26FE57	G,P	ABY	THR- 20	C 20	ACT-I		4PI	

COBALT Z=27

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
59	100.00	10.5	7.4	16.6	20.3	7.0	19.0	17.4	19.3

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
65WY1	27CO59	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
68AL1	27CO59	G,G	LFT	1	C 4	SCD-D	0- 3	130	1=1.187 MEV
67LO1	27CO59	G,G/	ABX	14- 32	C 34	NAI-D		DST	
64CO3	27CO59	G,N	ABI	THR- 80	C 10- 80	BF3-I		4PI	
67GE2	27CO59	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67HU1	27CO59	G,N	ABX	11	D 11	BF3-I		4PI	
67LI1	27CO59	G,N	RLY	THR- 54	C 35, 54	ACT-I		4PI	REL C11, ISM RATIO
67LI1	27CO59	G,2N	RLY	THR- 54	C 35, 54	ACT-I		4PI	REL G,N
67LI1	27CO59	G,3N	RLY	THR- 54	C 35, 54	ACT-I		4PI	REL G,N
67LI1	27CO59	G,4N	RLY	THR- 54	C 35, 54	ACT-I		4PI	REL GN
64BA4	27CO59	G,XN	ABX	10- 27	C 10- 27	BF3-I		4PI	65BA3 SAME DATA
65BA3	27CO59	G,XN	ABX	THR- 28	C 10- 30	BF3-I		4PI	
66FI2	27CO59	G,XN	SPC	THR- 60	C 60	TOF-D	5- 40	90	
68GA1	27CO59	$ G,XN	SPC	THR- 85	C 85	CCH-D	1- 15	135	NEUT POLARIZATION
68RH1	27CO59	G,XN	NOX	THR- 48	C 48	ACT-I		4PI	
57RO1	27CO59	G,P	SPC	15, 18	D 15, 18	EMU-D	3- 7	DST	
66WA1	27CO59	G,5N2P	RLY	THR-150	C150	ACT-I		4PI	ISOMER RATIO MN52
67LI1	27CO59	G,XNYP	RLY	THR- 54	C 35, 54	ACT-I		4PI	REL GN, MN56 FINAL
66WA2	27CO60	N,G	RLY	7	D 0	SCD-D	5- 8	45	

NICKEL Z=28

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
58	67.88	12.2	8.2	21.1	17.7	6.4	22.5	19.6	14.2
60	26.23	11.4	9.5	20.1	19.2	6.3	20.4	20.0	16.9
61	1.19	7.8	9.9	19.3	17.0	6.5	19.2	17.4	18.1
62	3.66	10.6	11.1	19.5	21.0	7.0	18.4	20.5	19.8
64	1.08	9.7	12.5	19.1	22.9	8.0	16.5	21.0	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
65WY1	28NI	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
66BE3	28NI	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
69CE1	28NI	G,G	NOX	6- 8	D 6- 8	SCD-D	0- 8	DST	
65GI1	28NI	G,G/	RLY	8	D 8	NAI-D	8	135	
64CO3	28NI	G,N	ABI	THR- 80	C 10- 80	BF3-I		4PI	
67HU2	28NI	G,N	ABY	THR- 22	C 22	THR-I	4-	DST	
64BA4	28NI	G,XN	ABX	10- 27	C 10- 27	BF3-I		4PI	65BA3 SAME DATA
64BA5	28NI	G,XN	ABX	12- 28	C 12- 28	BF3-I		4PI	
65BA3	28NI	G,XN	ABX	THR- 28	C 10- 30	BF3-I		4PI	
68FI1	28NI	G,XN	ABX	11- 25	C 11- 25	BF3-I		4PI	
68GA1	28NI	$ G,XN	SPC	THR- 85	C 85	CCH	1- 15	135	NEUT POLARIZATION

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
67KN1	28NI	G,T	RLY	THR- 49	C 36, 49	ACT-I		4PI	
66HO3	28NI	G,A	SPC	THR- 31	C 31	SCD-D	3- 14	130	
66BE1	28NI	N,G	SPC	16	D 7	NAI-D	8- 18		
66DU1	28NI58	E,E/	FMF	1	D 45- 65	MAG-D		DST	1=1.452
67DU1	28NI58	E,E/	FMF	1- 5	D 45- 65	MAG-D		DST	B(EL), 4 LEVELS
69GU1	28NI58	E,E/	ABX	10- 30	D199	MAG-D	169-189	40	FMF
68MI1	28NI58	G,N	ABX	THR- 25	C 10- 25	BF3-I		4PI	
68GO4	28NI58	G,XN	ABX	THR- 30	C 7- 30	BF3-I		4PI	
69OW1	28NI58	G,XN	ABX	12- 25	C 12- 25	BF3-I		4PI	
70OW1	28NI58	G,XN	ABX	11- 24	C 10- 24	BF3-I		4PI	
64MA2	28NI58	G,XP	SPC	THR- 22	C 22	SCD-D	3- 9		
66DU1	28NI60	E,E/	FMF	1	D 45- 65	MAG-D		DST	1=1.332 MEV
67DU1	28NI60	E,E/	FMF	1, 4	D 45- 65	MAG-D			B(EL)1.33,4.03 MEV
69GU1	28NI60	E,E/	ABX	10- 30	D199	MAG-D	172-188	DST	FMF
69TO3	28NI60	E,E/	FMF	0- 8	D183,250	MAG-D	176-250	DST	B(EL),J-PI
67BE5	28NI60	G,G	LFT	1	D 1	NAI-D		120	
68MI1	28NI60	G,N	ABX	THR- 25	C 10- 25	BF3-I		4PI	
68GO4	28NI60	G,XN	ABX	THR- 30	C 7- 30	BF3-I		4PI	
69OW1	28NI60	G,XN	ABX	12- 25	C 12- 25	BF3-I		4PI	
70OW1	28NI60	G,XN	ABX	11- 24	C 10- 24	BF3-I		4PI	
66DU1	28NI62	E,E/	FMF	1	D 45- 65	MAG-D		DST	1=1.172 MEV
67DU1	28NI62	E,E/	FMF	1, 4	D 45- 65	MAG-D		DST	B(EL)1.17,3.75 MEV
67ST1	28NI62	G,G	LFT	7	D 7	NAI-D	4- 7	135	7=7.64 MEV
68MO1	28NI62	G,G	NOX	7	D 7	NAI-D	5- 8	90	POLARIMETER 7.646
67ES1	28NI62	G,G/	ABX	8	D 8	NAI-D		DST	
69GU1	28NI64	E,E/	ABX	10- 30	D150	MAG-D	120-140	55	FMF

COPPER Z=29

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
63	69.09	10.8	6.1	16.1	18.9	5.8	19.7	16.8	17.2
65	30.91	9.9	7.4	15.5	20.7	6.8	17.8	17.1	19.9

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
59BA3	29CU	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI	E
64CH1	29CU	E,P	ABX		D999	MAG-D	110-450	DST	999=1 GEV
65WY1	29CU	G,MU-T	ABX	10- 35	C 90	SCI-D		4PI	
66BE3	29CU	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
67GI1	29CU	G,G	LFT	6, 8	D 6- 8	NAI-D	4- 8	DST	6,8=6.07,8.50 MEV
67TU4	29CU	G,G	ABX	6	D 6	NAI-D			NSA 22571
64CO3	29CU	G,N	ABI	THR- 80	C 10- 80	BF3-I		4PI	
67GE2	29CU	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
68KA1	29CU	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
64AL5	29CU	G,XN	NOX	THR- 34	C 34	THR-I	6	DST	
64BA4	29CU	G,XN	ABX	10- 27	C 10- 27	BF3-I		4PI	65BA3 SAME DATA
65BA3	29CU	G,XN	ABX	THR- 28	C 10- 30	BF3-I		4PI	
68TO1	29CU	G,XN	ABX	10- 24	C 10- 24	BF3-I		4PI	MONTR CALIBRATION

373-303 O-70—5

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
65ME2	29CU	G,A	SPC	THR- 35	C 35	SCD-D	5- 26	90	
64MA4	29CU	G,XXX	ABY	150-720	C150-720	ACT-I		4PI	XXX= CU62 FINAL
65HE1	29CU63	E,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
65HE1	29CU63	E+,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
68AL1	29CU63	G,G	LFT	0- 2	C 4	SCD-D	0- 3	130	1.414,1.551 MEV
68TA2	29CU63	G,G	LFT	1	D 1	NAI-D	1	90	1=.963 MEV
69BE7	29CU63	G,G	LFT	6, 8	D 6, 8	D		DST	6.07, 8.50 MEV
65GR1	29CU63	G,N	ABX	THR- 44	C 10- 66	ACT-I		4PI	
68OW1	29CU63	G,N	RLX	12- 24	C 10- 24	ACT-I		4PI	
68SU1	29CU63	G,N	ABX	THR- 25	D 10- 25	ACT-I		4PI	
68SU1	29CU63	G,2N	ABX	THR- 26	D 10- 26	ACT-I		4PI	
64MA2	29CU63	G,XP	SPC	THR- 17	C 17	SCD-D	3- 9		
68AB2	29CU63	G,XP	SPC	THR- 27	C 27	SCD-D	2- 16	90	
66HO3	29CU63	G,A	ABY	THR- 31	C 31	SCD-D	3- 14	130	
68OK1	29CU63	G,A	ABY	THR- 20	C 20	ACT-I		4PI	
68RI3	29CU63	G,NA	RLY	THR- 50	C 30- 50	ACT-I		4PI	RLY G,2N
68RI3	29CU63	G,2NA	RLY	THR- 50	C 30- 50	ACT-I		4PI	RLY G,2N
67DE4	29CU64	G,N	NOX	THR-260	C260	TRK-I		DST	
66VO1	29CU64	G,P	RLY	THR- 52	C 23- 52	TEL-D	4- 5	90	
66VO1	29CU64	G,D	RLY	THR- 52	C 23- 52	TEL-D	4- 6	90	
68ME3	29CU65	G,G	LFT	1	D 1	NAI-D		DST	1=1.116 MEV
69BE7	29CU65	G,G	LFT	6, 8	D 6, 8	D		DST	6.07, 8.50 MEV
68AB2	29CU65	G,XP	SPC	THR- 27	C 27	SCD-D	2- 16	90	

ZINC Z=30

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
64	48.89	11.9	7.7	19.0	16.7	4.0	21.0	18.6	13.8
66	27.81	11.0	8.9	18.2	18.3	4.6	19.0	18.8	16.4
67	4.11	7.1	8.9	17.4	15.7	4.8	18.1	16.0	17.3
68	18.57	10.2	10.0	17.7	19.8	5.3	17.3	19.1	18.5
70	0.62	9.2	*	17.2	*	5.9	15.7	19.5	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
66BE3	30ZN	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
67HU2	30ZN	G,N	ABY	THR- 22	C 22	THR	4	DST	
68KA1	30ZN	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
67CO1	30ZN	G,XN	ABX	12- 24	C 24	BF3-I		4PI	
57OS1	30ZN	G,P	ABX	THR- 31	C 20- 31	EMU-D	4- 18	DST	
66HO3	30ZN	G,A	SPC	THR- 31	C 31	SCD-D	3- 14	130	
66AC1	30ZN	G,D	YLD	16- 22	C 22	MAG-D		4PI	YIELD UPPER LIMIT
65VA3	30ZN	G,XXX	ABI	50-300	C 50-300	ACT-I		4PI	XXX=CU64
69BE7	30ZN64	G,G	LFT	7	D 7	D		DST	7.38 MEV
67CA1	30ZN64	G,N	RLX	12- 22	C 12- 22	ACT-I		4PI	
68OW1	30ZN64	G,N	RLX	12- 24	C 10- 24	ACT-I		4PI	
57EL1	30ZN64	G,2N	RLY	THR- 30	C 32	ACT-I		4PI	

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REF    NUCLIDE REACTION RES  EXCIT  SOURCE    DETECTOR  ANG  REMARKS
        Z   A  IN,OUT               MIN-MAX TYPE MIN-MAX

67BE5  30ZN66   G,G    LFT   1     D  1     NAI-D       120 1=1.064 MEV
68SH5  30ZN66   G,G    NOX   7     D  7     SCD   1-  7 DST 7=7.368 MEV
69SH1  30ZN66   G,G    LFT   7     D  7     SCD-D       135 7=7.368 MEV
64CO3  30ZN66   G,N    ABI THR- 80 C 10- 80 BF3-I       4PI
57EL1  30ZN66   G,NP   ABX  22- 30 C 32     ACT-I       4PI                 E
68OK3  30ZN66   G,NP   ABY THR- 20 C 20     ACT-I       4PI

66IV1  30ZN67   G,P    ABX THR- 28 C 12- 28 ACT-I       4PI

57EL1  30ZN68   G,P    ABX  13- 30 C 32     ACT-I       4PI                 E
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GALLIUM Z=31

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
69	60.4	10.3	6.6	15.4	18.0	4.5	16.6	16.9	16.6
71	39.6	9.3	7.9	15.1	19.7	5.3	17.0	17.1	*

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REF    NUCLIDE REACTION RES  EXCIT  SOURCE    DETECTOR  ANG  REMARKS
        Z   A  IN,OUT               MIN-MAX TYPE MIN-MAX

64CO3  31GA     G,N    ABI THR- 80 C 10- 80 BF3-I       4PI
64BA4  31GA     G,XN   ABX  10- 27 C 10- 27 BF3-I       4PI 65BA3 SAME DATA
64BA5  31GA     G,XN   ABX  11- 26 C 11- 26 BF3-I       4PI
65BA3  31GA     G,XN   ABX THR- 28 C 10- 30 BF3-I       4PI

68AL1  31GA69   G,G    LFT   0-  1 C  4     SCD-D 0-  3 130 0.872,1.107 MEV
68LA1  31GA69   G,G    LFT   0-  1 D  0-  1 NAI-D       130 4 LEVELS TO 1.337

68OK1  31GA71   G,A    ABY THR- 20 C     20 ACT-I       4PI
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GERMANIUM Z=32

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
70	20.52	11.5	8.5	18.6	17.6	4.1	20.	18.9	15.1
72	27.43	10.7	9.7	18.2	19.1	5.0	18.2	19.1	17.6
73	7.76	6.8	10.0	17.3	16.7	5.3	17.5	16.5	18.4
74	36.54	10.1	11.0	18.2	20.8	6.3	17.0	20.2	19.9
76	7.76	9.4	*	18.4	*	7.5	16.9	20.8	*

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REF    NUCLIDE REACTION RES  EXCIT  SOURCE    DETECTOR  ANG  REMARKS
        Z   A  IN,OUT               MIN-MAX TYPE MIN-MAX

64CO3  32GE     G,N    ABI THR- 80 C 10- 80 BF3-I       4PI
68KR2  32GE     G,A    ABX THR- 33 C 33     SCD-D 4- 11  90

68OK1  32GE73   G,A    ABY THR- 20 C 20     ACT-I       4PI

68OK3  32GE74   G,P    ABY THR- 20 C 20     ACT-I       4PI

68OK2  32GE76   G,N    ABY THR- 20 C 20     ACT-I       4PI ISOMERIC YIELD
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ARSENIC Z=33

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
75	100.00	10.2	6.9	15.4	19.4	5.3	18.3	17.1	17.9

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
64SH5	33AS75	G,G	LFT	1	D	1	NAI-D		122	1=.265 MEV
67LA1	33AS75	G,G	LFT	1	D	1	NAI-D		DST	1=.265,.280 MEV
68AL1	33AS75	G,G	LFT	0- 1	C	4	SCD-D	0- 3		0.86,1.07,1.35 MEV
64CO3	33AS75	G,N	ABI	THR- 80	C	10- 80	BF3-I		4PI	
67HU1	33AS75	G,N	ABX	11	D	11	BF3-I		4PI	
65FI1	33AS75	G,XN	ABX	10- 25	C	10- 25	BF3-I		4PI	
69BE1	33AS75	G,XN	ABX	THR- 30	D	10- 30	BF3-I		4PI	

SELENIUM Z=34

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
74	0.87	12.1	8.6	19.3	17.2	4.1	20.7	19.4	14.2
76	9.02	11.2	9.5	19.3	18.9	5.1	19.2	19.8	16.4
77	7.58	7.4	9.6	18.7	16.1	5.7	18.6	17.0	17.3
78	23.52	10.5	10.4	18.9	20.1	6.0	17.9	20.1	18.4
80	49.82	9.9	11.4	18.7	21.5	7.0	16.9	20.4	*
82	9.19	9.3	*	18.8	*	*	16.0	21.2	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
66BE3	34SE	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
67HU2	34SE	G,N	ABY	THR- 22	C	22	THR-I	4-	DST	
67CO2	34SE	G,XN	ABX	THR- 24	C	11- 24	BF3-I		4PI	
66WE2	34SE	G,A	ABX	6- 33	C	33	SCD-D	4- 16	90	
69BO3	34SE77	G,G	ABX	0- 2	C	0- 2	ACT-I		4PI	
68OK3	34SE77	G,P	ABY	THR- 20	C	20	ACT-I		4PI	
68OK2	34SE78	G,N	ABY	THR- 20	C	20	ACT-I		4PI	ISOMERIC YIELD

BROMINE Z=35

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
79	50.54	10.7	6.3	15.8	18.7	5.5	19.0	16.9	16.7
81	49.46	10.2	7.5	15.9	20.2	6.5	18.0	17.4	18.9

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE MIN-MAX		
68JU1	35BR	G,N	NOX	THR- 27	C 27	THR-I 5-	DST	
66LA1	35BR79	G,G	LFT	0- 1	D 0- 1	NAI-D 0- 1	123	1=.834 MEV
68OK1	35BR81	G,A	ABY	THR- 20	C 20	ACT-I	4PI	

KRYPTON Z=36

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
78	0.35	11.9	8.2	19.6	16.9	4.4	20.9	18.9	13.5
80	2.27	11.5	9.1	19.6	18.2	5.1	19.9	19.8	15.4
82	11.56	11.0	9.9	19.5	19.6	6.0	18.8	20.1	17.4
83	11.55	7.5	9.8	19.1	17.2	6.5	18.5	17.4	18.2
84	56.90	10.5	10.7	19.4	21.0	7.1	18.0	20.3	19.4
86	17.37	9.8	11.9	19.2	*	8.1	17.0	20.9	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE MIN-MAX		
69HO1	36KR	G,XP	ABY	THR- 33	C 24- 33	SCI-D 3- 14	90	
66BE2	36KR82	G,G	LFT	1	C 1	NAI-D 0- 2	113	1=.777 MEV
69HO1	36KR84	G,XP	ABY	THR- 33	C 24- 33	SCI-D 3- 14	90	

RUBIDIUM Z=37

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
85	72.15	10.5	7.0	16.5	19.6	6.6	19.	17.6	17.7
87	27.85	9.9	8.6	17.1	21.8	8.0	18.6	18.5	20.5

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE MIN-MAX		
69KN1	37RB85	G,N	RLY	10- 45	C 45	ACT-I	4PI	ISOMER YIELD

STRONTIUM Z=38

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
84	0.56	12.	8.	20.2	17.9	5.2	21.	19.6	14.6
86	9.86	11.5	9.6	20.	19.4	6.3	20.0	20.1	16.6
87	7.02	8.4	9.4	20.1	17.4	7.3	20.0	18.1	18.0
88	82.56	11.1	10.6	20.7	21.3	7.9	19.5	20.6	19.2

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68OK3	38SR87	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
68PE1	38SR88	E,E/	RLY	1- 7	D 65, 70	MAG-D	58- 70	DST	B(EL), 4 LEVELS
69SH5	38SR88	E,P	ABX	14- 25	D 16- 30	MAG-D	3- 14		
64BE7	38SR88	G,G	LFT	2	D 2	D			2=1.85 MEV
69HA1	38SR88	P,G	RLX	15- 22	D 4- 12	NAI-D	10- 22	90	

YTTRIUM Z=39

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
89	100.00	11.5	7.1	18.1	19.9	7.9	20.7	18.2	17.7

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67SH1	39Y 89	E,E/	FMF	2- 3	D225	MAG-D		DST	2.5 MEV
68PE1	39Y 89	E,E/	RLY	1- 3	D 65, 70	MAG-D	60- 70	DST	5 LEVELS
68AL1	39Y 89	G,G	LFT	2	C 4	SCD-D	0- 3	130	2=1.51 MEV
69BE4	39Y 89	G,N	ABX	11- 25	D 11- 26	MOD-I		4PI	
66FU2	39Y 89	G,2N	ABI	THR- 28	DTHR- 28	BF3-I		4PI	
66WA1	39Y 89	G,2N	RLY	THR-280	C150,280	ACT-I		4PI	ISOMER RATIO Y 87
69BE4	39Y 89	G,2N	ABX	21- 27	D 19- 28	MOD-I		4PI	
66FU2	39Y 89	G,XN	ABI	THR- 28	DTHR- 28	BF3-I		4PI	
67BE2	39Y 89	G,XN	ABX	THR- 28	DTHR- 28	BF3-I		4PI	
69SH4	39Y 89	G,P	ABX	7- 24	C 17- 24	EMU-D	2- 16	DST	
67TA2	39Y 89	G,XP	SPC	THR- 24	C 17, 24	EMU-D	2- 16	4PI	
66BL1	39Y 89	P,G	RLY	14- 17	D 5- 9	NAI-D		DST	
68SH1	39Y 89	P,G	ABX	13- 15	D 5- 9	NAI-D	0- 15	DST	
69RI1	39Y 89	P,G	ABX	12	D 5	SCD-D	9- 12	90	5=4.97-5.15 MEV

ZIRCONIUM Z=40

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
90	51.46	12.0	8.4	20.6	18.8	6.7	21.	19.9	15.5
91	11.23	7.2	8.7	18.6	14.9	5.4	19.2	15.6	16.2
92	17.11	8.6	9.4	15.7	17.2	3.0	15.8	17.4	17.1
94	17.40	8.2	10.3	15.9	18.5	3.8	14.9	17.8	18.9
96	2.80	7.8	11.	16.1	20.9	4.9	14.3	18.5	21.2

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
66BE3	40ZR	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
67HU2	40ZR	G,N	ABY	THR- 22		THR-I	4-	DST	
65DU1	40ZR	G,P	ABX	18- 26	D 17- 24	EMU-D	3- 13	DST	
69SH4	40ZR	G,P	ABX	8- 24	C 20, 24	EMU-D	2- 14	DST	
69BO2	40ZR90	E,E/	FMF	2- 4	D 58	MAG-D	50- 58	DST	2.18 TO 3.84 MEV
68SH4	40ZR90	E,P	SPC	11- 20	D 20	MAG-D	3- 12	90	ANALOG STATES
69SH5	40ZR90	E,P	ABX	12- 23	D 16- 24	MAG-D	4- 14		
69RA1	40ZR90	G,G	LFT	9	D 9	NAI		DST	9=8.496 MEV
65CO1	40ZR90	G,N	ABX	THR- 70	C 12- 70	ACT-I		4PI	
66FU2	40ZR90	G,2N	ABI	THR- 28	DTHR- 28	BF3-I		4PI	
66FU2	40ZR90	G,XN	ABI	THR- 28	DTHR- 28	BF3-I		4PI	
67BE2	40ZR90	G,XN	ABX	THR- 28	DTHR- 28	BF3-I		4PI	
66OB1	40ZR90	P,G	RLX	11- 14	D 2- 6	NAI-D	0- 14	90	
67AX1	40ZR90	P,G	ABX	14- 25	D 5- 17	NAI-D	10- 24	90	
67OB1	40ZR90	P,G	ABX	12- 13	D 4- 5	NAI-D	9- 13	0	
69HA1	40ZR90	P,G	RLX	16- 22	D 7- 14	NAI-D	10- 22	DST	
69MA4	40ZR90	P,G	ABX	10- 27	D 2- 19	NAI-D	10- 27	DST	
66FU2	40ZR91	G,2N	ABI	THR- 30	DTHR- 30	BF3-I		4PI	
66FU2	40ZR91	G,XN	ABI	THR- 30	DTHR- 30	BF3-I		4PI	
67BE2	40ZR91	G,XN	ABX	THR- 30	DTHR- 30	BF3-I		4PI	
66FU2	40ZR92	G,2N	ABI	THR- 28	DTHR 28	BF3-I		4PI	
66FU2	40ZR92	G,XN	ABI	THR- 28	DTHR 28	BF3-I		4PI	
67BE2	40ZR92	G,XN	ABX	THR- 28	DTHR- 28	BF3-I		4PI	
66FU2	40ZR94	G,2N	ABI	THR- 30	DTHR 30	BF3-I		4PI	
66FU2	40ZR94	G,XN	ABI	THR- 30	DTHR 30	BF3-I		4PI	
67BE2	40ZR94	G,XN	ABX	THR- 30	DTHR- 30	BF3-I		4PI	

NIOBIUM Z=41

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
93	100.00	8.8	6.0	13.4	15.7	2.0	16.6	14.7	15.4

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67SH1	41NB93	E,E/	FMF	2- 3	D225	MAG-D		DST	2.2 MEV
67HU1	41NB93	G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
67HU2	41NB93	G,N	ABY	THR- 22	C 22	THR-I	4-	DST	
67KR1	41NB93	G,A	SPC	2- 31	C 31	SCD-D	6- 15	90	
68KR2	41NB93	G,A	ABX	THR- 33	C 33	SCD-D	7- 14	90	
66WA1	41NB93	G,4N2P	RLY	THR-280	C150,280	ACT-I		4PI	ISOMER RATIO Y 87

MOLYBDENUM Z=42

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
92	15.84	12.6	7.3	20.8	16.9	5.	22.8	19.5	12.6
94	9.04	9.7	8.5	16.6	15.4	2.1	17.7	17.4	14.5
95	15.72	7.4	8.7	16.2	14.2	2.2	17.1	15.9	15.1
96	16.53	9.2	9.3	16.5	16.6	2.8	16.5	17.8	16.1
97	9.46	6.8	9.2	16.1	15.2	2.8	16.0	16.1	16.5
98	23.78	8.6	9.8	16.3	17.4	3.3	15.5	17.9	17.3
100	9.63	8.3	11.	15.5	18.2	3.2	14.2	18.	19.

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS	
66BE3	42MO	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135		
67HU2	42MO	G,N	ABY	THR- 22	C 22	THR-I	4-	DST		
68JU1	42MO	G,N	NOX	THR- 22	C 22	THR-I	5-	DST		
65CO1	42MO92	G,N	RLX	THR- 70	C 12- 70	ACT-I		4PI		
68GE1	42MO92	G,N	ABX	12- 26	CTHR- 26	ACT-I		4PI		
68OK2	42MO92	G,N	ABY	THR- 20	C 20	ACT-I		4PI	ISOMERIC YIELD	
57EL1	42MO92	G,P	RLY	THR- 32	C 32	ACT-I		4PI		E
57EL1	42MO92	G,NP	RLY	THR- 32	C 32	ACT-I		4PI		E
67LA3	42MO95	G,G	LFT	1	D 1	NAI-D	0- 1	DST	1=0.766 MEV	
69BE7	42MO96	G,G	LFT	6	D 6	D		DST	6.41, 6.44 MEV	
68GE1	42MO97	G,P	ABX	13- 26	CTHR- 26	ACT-I		4PI		
68GE1	42MO98	G,P	ABX	13- 26	CTHR- 26	ACT-I		4PI		
68GE1	42MO100	G,N+P	ABX	7- 26	CTHR- 26	ACT-I		4PI		

TECHNETIUM Z=43

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
93		12.9	4.1	18.4	15.9	5.1		16.7	11.4

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
69EJ2	43TC93	P,G	ABX	9, 10	D 6, 7	SCD-D		DST	5.75-6.05,6.5-6.63

RUTHENIUM Z=44

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
96	5.51	10.1	7.3	17.4	14.2	1.7	*	17.3	12.2
98	1.87	10.3	8.	17.1	15.4	2.2	18.3	17.7	14.0
99	12.72	7.5	8.4	14.4	14.6	2.3	17.7	15.8	14.7
100	12.62	9.7	9.2	16.9	16.6	2.9	17.1	18.1	15.7
101	17.07	6.8	9.4	16.4	14.8	2.8	16.5	16.0	16.6
102	31.61	9.2	10.1	14.1	14.4	3.4	16.0	18.6	17.5
104	18.58	8.9	10.5	16.7	19.5	4.3	15.1	19.	19.

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68JU1	44RU	G,N	NOX	THR- 27	C 27	THR-I	5-	DST	

RHODIUM Z=45

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
103	100.00	9.3	6.2	13.9	15.6	3.1	16.8	15.4	16.3

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
65KR1	45RH103	E,E/	RLY	7- 18	D 7- 18	ACT-I		4PI	ISOMER YIELD
65KR1	45RH103	G,G/	RLY	7- 18	C 7- 18	ACT-I		4PI	ISOMER YIELD
67HU1	45RH103	G,N	ABX	10, 11	D 10, 11	BF3-I		4PI	
68JU1	45RH103	G,N	NOX	THR- 27	C 27	THR-I	5-	DST	
69DE1	45RH103	G,N	ABY	THR-999	C 1- 6	ACT-1		4PI	999=5.5 GEV
69DE1	45RH103	G,2N	ABY	THR-999	C 1- 6	ACT-1		4PI	999=5.5 GEV
65KR1	45RH103	G,2P	ABX	15- 40	C 15- 40	ACT-I		4PI	

PALLADIUM Z=46

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
102	0.96	10.4	7.8	17.4	15.2	2.1	19.	17.7	13.3
104	10.97	10.0	8.7	17.0	16.4	2.6	17.6	18.0	14.9
105	22.23	7.1	8.8	16.6	14.2	2.9	17.1	15.8	15.7
106	27.33	9.5	9.3	16.8	17.6	3.2	16.6	18.4	16.4
108	26.71	9.2	10.0	16.6	18.5	3.9	15.8	18.5	17.8
110	11.81	8.8	11.	16.4	19.6	4.4	15.0	18.7	19.2

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
68JU1	46PD	G,N	NOX	THR- 27	C 27	THR-I 5-	DST	
67KN1	46PD	G,T	RLY	THR- 49	C 36, 49	ACT-I	4PI	
68OK3	46PD104	G,NP	ABY	THR- 20	C 20	ACT-I	4PI	
69DA1	46PD106	G,G	ABY	1	D 1	NAI-D 0- 1	120	1=.5117 MEV
69DE2	46PD108	G,XN	ABX	9- 25	C 9- 25	BF3-I	4PI	
69DE5	46PD108	G,XN	ABX	8- 25	C 8- 25	BF3-I	4PI	
69DE2	46PD108	G,P	ABX	9- 25	C 9- 25	ACT-I	4PI	
69DE5	46PD108	G,P	ABX	15- 28	C 8- 28	ACT-I	4PI	
69DE5	46PD110	G,N	ABX	8- 28	C 8- 28	ACT-I	4PI	ISOMER YIELD ONLY

SILVER Z=47

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
107	51.35	9.5	5.8	13.9	16.4	2.8	17.	15.4	15.1
109	48.65	9.2	6.5	13.8	17.3	3.3	16.5	15.8	16.4

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
65WY1	47AG	G,MU-T	ABX	10- 35	C 90	SCI-D	4PI	
67GE2	47AG	G,N	ABY	THR- 27	C 22, 27	BF3-I	4PI	
67HU1	47AG	G,N	ABX	10, 11	D 10, 11	BF3-I	4PI	
68FI1	47AG	G,XN	ABX	9- 25	C 9- 25	BF3-I	4PI	
56WA1	47AG	G,T	RLY	THR- 31	C 31	ACT-I	4PI	E
65ME2	47AG	G,A	SPC	THR- 35	C 35	SCD-D 5- 26	90	
66WE2	47AG	G,A	ABX	3- 33	C 33	SCD-D 4- 16	90	
64DE4	47AG	G,F	ABX	300-999	C300-999	EMU-D300-999	4PI	
65HE1	47AG107	E,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
65HE1	47AG107	E+,N	RLY	THR- 32	D 14- 32	ACT-I	4PI	
66CA1	47AG107	G,G/	ABI	0- 2	C 0- 2	ACT-I	4PI	5 LEVELS
69BO3	47AG107	G,G	ABX	0- 2	C 0- 2	ACT-I	4PI	
69BE1	47AG107	G,XN	ABX	THR- 30	D 9- 30	BF3-I	4PI	SEP ISOTOPES
66WI1	47AG107	G,T	ABX	THR- 56	C 31- 56	ACT-I	4PI	
66CA1	47AG109	G,G/	ABI	0- 2	C 0- 2	ACT-I	4PI	6 LEVELS
69BO3	47AG109	G,G	ABX	0- 2	C 0- 2	ACT-I	4PI	
68OK1	47AG109	G,A	ABY	THR- 20	C 20	ACT-1	4PI	

CADMIUM Z=48

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
106	1.22	11.	7.	17.2	14.6	1.6	19.	17.4	12.3
108	0.88	10.3	8.1	17.	15.7	2.3	18.3	17.7	13.9
110	12.39	9.9	8.9	16.9	16.9	2.9	17.2	18.1	15.4
111	12.75	7.0	9.1	16.6	14.6	3.3	16.8	15.9	16.2
112	24.07	9.4	9.7	16.8	17.9	3.5	16.4	18.5	16.8
113	12.26	6.5	9.7	16.5	15.6	3.9	15.9	16.2	17.6
114	28.86	9.0	10.3	16.8	18.9	4.1	15.6	18.8	18.3
116	7.58	8.7	11.2	*	16.6	4.9	14.7	18.7	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	48CD	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
69RA1	48CD	G,G	NOX	7	D 7	NAI-D		DST	7=6.485 MEV
65GI1	48CD	G,G/	RLY	8	D 8	NAI-D	8	135	8=7.64 MEV
67HU2	48CD	G,N	ABY	THR- 22	C 22	THR-I	4-	DST	
69MI1	48CD110	G,G	SPC	6- 8	D 6- 8	SCD-D	4- 8	DST	
65CH1	48CD111	E,E/	ABX	1	D 1- 2	ACT-I		4PI	1=1.34 MEV
66CA1	48CD111	G,G/	ABI	0- 2	C 0- 2	ACT-I		4PI	.76, 1.12, 1.3 MEV
69BO3	48CD111	G,G	ABX	0- 2	C 0- 2	ACT-I		4PI	
66MI1	48CD112	G,G	ABX	8	D 8	NAI-D	0- 8	DST	8=7.64 MEV
68MO1	48CD112	$ G,G	NOX	7	D	NAI-D	5- 8	90	POLARIMETER 7.63
69CE1	48CD112	G,G	NOX	6- 8	D 6- 8	SCD-D	0- 8	DST	
69MI1	48CD112	G,G	SPC	6- 8	D 6- 8	SCD-D	4- 8	DST	
68OK3	48CD113	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
67ST1	48CD114	G,G	LFT	7	D 7	NAI-D	4- 7	135	7=7.64 MEV

INDIUM Z=49

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
113	4.28	9.4	6.1	13.9	16.8	3.0	17.3	15.5	15.7
115	95.72	9.0	6.8	13.9	17.9	3.8	16.3	15.9	17.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
68KA1	49IN	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
69FU1	49IN	G,N	ABX	9- 31	D 9- 31	BF3-I		4PI	
69FU1	49IN	G,2N	ABX	16- 31	D 16- 31	BF3-I		4PI	
69FU1	49IN	G,3N	ABX	25- 31	D 25- 31	BF3-I		4PI	
65ME2	49IN	G,A	SPC	THR- 35	C 35	SCD-D	5- 26	90	
66VE1	49IN113	G,G/	ABX	1	D 0- 1	ACT-I		4PI	1=.392 MEV
65CH1	49IN115	E,E/	ABX	1	D 1- 2	ACT-I		4PI	1=1.07 MEV
65KR1	49IN115	E,E/	RLY	7- 18	D 7- 18	ACT-I		4PI	ISOMER YIELD

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS	
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX			
65KR1	49IN115	G,G/	RLY	7- 18	C	7- 18	ACT-I		4PI	ISOMER YIELD	
66VE1	49IN115	G,G/	ABX	1	D	0- 1	ACT-I		4PI	1=1.04 MEV	
68BO3	49IN115	G,G	ABI	1, 1	C	0- 1	ACT-I		4PI	1,1=600,830 KEV	
69BO3	49IN115	G,G	ABX	0- 2	C	0- 2	ACT-I		4PI		
67HU1	49IN115	G,N	ABX	10, 11	D	10, 11	BF3-I		4PI		
56HE2	49IN115	G,2P	RLY	THR- 31	C	31	ACT-I		4PI	REL G,A	E
56HE2	49IN115	G,A	RLY	THR- 31	C	31	ACT-I		4PI	REL NEUTRONS	E
68OK1	49IN115	G,A	ABY	THR- 20	C	20	ACT-I		4PI		

TIN Z=50

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
112	0.96	11.1	7.8	17.1	15.0	1.8	*	17.6	12.9
114	0.66	10.3	8.5	14.3	15.3	2.6	18.1	18.0	14.6
115	0.35	7.5	8.7	17.0	14.4	3.2	17.9	16.1	15.6
116	14.30	9.6	9.3	17.1	17.4	3.4	17.1	18.3	16.1
117	7.61	6.9	9.5	16.8	15.3	3.8	16.5	16.2	16.9
118	24.03	9.3	10.0	17.1	18.5	4.1	16.3	18.8	17.5
119	8.58	6.5	9.9	16.8	16.3	4.4	15.8	16.5	18.2
120	32.85	9.1	10.8	17.1	19.6	4.8	15.6	19.0	19.0
122	4.72	8.8	11.6	17.3	20.8	5.7	15.0	20.	*
124	5.94	8.5	12.	18.	*	*	14.4	20.4	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS
	Z A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
66BE3	50SN	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
69RA1	50SN	G,G	NOX	7	D	7	NAI-D		DST	7=6.988 MEV
69SH2	50SN	G,G	SPC	6, 7	D	6, 7	SCD-D	6- 8		6=6.736,7=7.368
67HU2	50SN	G,N	ABY	THR- 22	C	22	THR-I	4-	DST	
68KA1	50SN	G,N	ABX	50- 85	C	55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
64AL5	50SN	G,XN	NOX	THR- 34	C	34	THR-I	6-	DST	
67BA4	50SN116	E,E/	FMF	1, 2	D	150	MAG-D	145-150	DST	1.27,2.24 MEV
69CU1	50SN116	E,E/	FMF	1- 12	D	55, 60	MAG-D		DST	
69FU1	50SN116	G,N	ABX	9- 29	D	9- 29	BF3-I		4PI	
69FU1	50SN116	G,2N	ABX	17- 29	D	17- 29	BF3-I		4PI	
69FU1	50SN116	G,3N	ABX	27- 29	D	27- 29	BF3-I		4PI	
67GI1	50SN117	G,G	LFT	7	D	6- 7	NAI-D	4- 8	DST	7=7.01 MEV
69BE7	50SN117	G,G	LFT	7	D	7	D		DST	7.01 MEV
69FU1	50SN117	G,N	ABX	6- 31	D	6- 31	BF3-I		4PI	
69FU1	50SN117	G,2N	ABX	16- 31	D	16- 31	BF3-I		4PI	
69FU1	50SN117	G,3N	ABX	24- 31	D	24- 31	BF3-I		4PI	
68OK3	50SN117	G,P	ABY	THR- 20	C	20	ACT-I		4PI	
69CU1	50SN118	E,E/	FMF	1- 4	D	55, 60	MAG-D		DST	
66HR1	50SN118	G,G	LFT	1	D	1	NAI-D	1	90	1=1.22 MEV
69CE1	50SN118	G,G	NOX	6- 8	D	6- 8	SCD-D	0- 8	DST	
69FU1	50SN118	G,N	ABX	9- 30	D	9- 30	BF3-I		4PI	
69FU1	50SN118	G,2N	ABX	16- 30	D	16- 30	BF3-I		4PI	
69FU1	50SN118	G,3N	ABX	25- 30	D	25- 30	BF3-I		4PI	

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
69FU1	50SN119	G,N	ABX	6- 31	D	6- 31	BF3-I		4PI	
69FU1	50SN119	G,2N	ABX	15- 31	D	15- 31	BF3-I		4PI	
69FU1	50SN119	G,3N	ABX	22- 31	D	22- 31	BF3-I		4PI	
67BA4	50SN120	E,E/	FMF	1, 2	D	150	MAG-D	145-150	DST	1.18,2.40 MEV
69CU1	50SN120	E,E/	FMF	1- 4	D	55, 60	MAG-D		DST	
66HR1	50SN120	G,G	LFT	1	D	1	NAI-D	1	90	1=1.18 MEV
69FU1	50SN120	G,N	ABX	9- 29	D	9- 29	BF3-I		4PI	
69FU1	50SN120	G,2N	ABX	15- 29	D	15- 29	BF3-I		4PI	
69FU1	50SN120	G,3N	ABX	24- 29	D	24- 29	BF3-I		4PI	
67BA4	50SN124	E,E/	FMF	1, 2	D	150	MAG-D	145-150	DST	1.13,2.59 MEV
69CU1	50SN124	E,E/	FMF	1- 4	D	55, 60	MAG-D		DST	
69FU1	50SN124	G,N	ABX	8- 31	D	8- 31	BF3-I		4PI	
69FU1	50SN124	G,2N	ABX	14- 31	D	14- 31	BF3-I		4PI	
69FU1	50SN124	G,3N	ABX	23- 31	D	23- 31	BF3-I		4PI	

ANTIMONY Z=51

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
121	57.25	9.3	5.8	12.9	17.1	3.1	16.3	14.9	16.6
123	42.75	9.0	6.6	13.1	18.	4.1	15.8	15.4	18.

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
66BE3	51SB	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
67HU1	51SB	G,N	ABX	10, 11	D	10, 11	BF3-I		4PI	
68JU1	51SB	G,N	NOX	THR- 27	C	27	THR-I	5-	DST	
56HE2	51SB121	G,A	RLY	THR- 31	C	31	ACT-I		4PI	REL NEUTRONS E
64SH5	51SB123	G,G	LFT	1	D	1	NAI-D		122	1=0.161 MEV

TELLURIUM Z=52

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
120	8.9(-2)	10.3	7.2	15.8	13.9	0.3	18.	16.8	12.3
122	2.46	10.1	8.0	15.8	15.2	1.1	17.0	17.3	13.8
123	0.87	6.9	8.1	15.7	13.0	1.5	17.0	15.0	14.5
124	4.61	9.4	8.6	15.9	16.2	1.8	16.4	17.6	15.1
125	6.99	6.6	8.7	15.7	14.0	2.2	16.0	15.2	15.8
126	18.71	9.1	9.1	15.8	17.2	2.5	15.7	17.9	16.4
128	31.79	8.8	9.6	15.7	18.0	3.2	15.1	18.0	17.5
130	34.48	8.4	10.1	15.6	18.7	3.7	14.5	18.0	18.5

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
66BE3	52TE	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
65AK1	52TE124	G,G	LFT	1	D	1	NAI-D		100	1=.603 MEV
68SC1	52TE124	G,G	LFT	1	D	1	NAI-D		105	1=603 KEV
66ME1	52TE125	G,G	LFT	1	D	1	SCD-D	1	DST	1=.463 MEV

IODINE Z=53

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
127	100.00	9.1	6.2	13.4	16.3	2.2	16.2	15.4	15.3

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS
	Z	A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
66FR1	53I	127	G,G	LFT	1	D	1	SCD-D	1	140	1=.203 MEV
69LA1	53I	127	G,G	LFT	1	D	1	NAI-D	0- 1	130	1=375 KEV
66BR1	53I	127	G,N	ABX	THR- 33	D	8- 33	BF3-I		4PI	
67DI1	53I	127	G,N	ABX	300-100	C	100	ACT-I		4PI	999=1 GEV
67HU1	53I	127	G,N	ABX	10, 11	D	10, 11	BF3-I		4PI	
68JO1	53I	127	G,N	ABY	THR-800	C	50-800	ACT-I		4PI	
69BE6	53I	127	G,N	ABX	9- 21	D	9- 31	MOD-I		4PI	
69DE1	53I	127	G,N	ABY	THR-999	C	1- 6	ACT-I		4PI	999=5.5 GEV
69VE2	53I	127	G,N	ABX	9- 32	D	9- 32	MOD-I		4PI	
66BR1	53I	127	G,2N	ABX	THR- 33	D	8- 33	BF3-I		4PI	
67DI1	53I	127	G,2N	ABX	300-999	C	999	ACT-I		4PI	999=1 GEV
68JO1	53I	127	G,2N	ABY	THR-800	C	50-800	ACT-I		4PI	
69BE6	53I	127	G,2N	ABX	16- 31	D	9- 31	MOD-I		4PI	
69VE2	53I	127	G,2N	ABX	16- 32	D	16- 32	MOD-I		4PI	
67DI1	53I	127	G,3N	ABX	300-999	C	999	ACT-I		4PI	999=1 GEV
68JO1	53I	127	G,3N	ABY	THR-800	C	50-800	ACT-I		4PI	
69BE6	53I	127	G,3N	ABX	27- 31	D	9- 31	MOD-I		4PI	
69DE1	53I	127	G,3N	ABY	THR-999	C	2- 6	ACT-I		4PI	999=5.5 GEV
69VE2	53I	127	G,3N	ABX	26- 32	D	26- 32	MOD-I		4PI	
68JO1	53I	127	G,4N	ABY	THR-800	C	50-800	ACT-I		4PI	
68JO1	53I	127	G,6N	ABY	THR-800	C	50-800	ACT-I		4PI	
68JO1	53I	127	G,7N	ABY	THR-800	C	50-800	ACT-I		4PI	
68JO2	53I	127	G,XN	ABX	THR-800	C	150-800	ACT-I		4PI	

XENON Z=54

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
124	0.10	10.0	7.0	16.5	14.1	0.5	*	16.7	11.7
126	0.09	10.0	7.6	16.0	14.9	1.3	17.9	17.2	13.2
128	1.92	9.6	8.2	15.9	15.7	1.8	16.8	17.3	14.4
129	26.44	6.9	8.3	15.7	13.6	2.1	16.6	15.1	15.0
130	4.08	9.3	8.7	15.9	16.5	2.3	16.2	17.6	15.5
131	21.18	6.6	8.8	15.7	14.4	2.5	15.9	15.3	16.0
132	26.89	8.9	9.1	15.7	17.2	2.7	15.5	17.7	16.5
134	10.44	8.5	9.5	15.6	17.9	3.2	15.0	17.8	17.5
136	8.87	7.9	10.0	15.4	*	3.6	14.4	17.8	*

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE		DETECTOR		ANG	REMARKS
	Z	A	IN,OUT				MIN-MAX	TYPE	MIN-MAX		
69HO1	54XE		G,XP	ABY	THR- 33	C	24- 33	SCI-D	3- 14	90	

CESIUM Z=55

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
133	100.00	9.0	6.1	13.2	16.2	2.1	16.2	15.1	15.3

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67HU1	55CS133	G,N	ABX	10, 11	D	10, 11	BF3-I		4PI	
69BE1	55CS133	G,XN	ABX	THR- 30	D	9- 30	BF3-I		4PI	

BARIUM Z=56

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
130	0.10	10.	7.	16.1	14.0	0.6	18.	16.8	12.0
132	9.7(-2)	9.6	7.6	15.7	14.6	0.9	17.2	16.9	13.1
134	2.42	9.2	8.0	15.7	15.4	1.4	16.6	17.1	14.2
135	6.59	7.2	8.5	15.7	13.6	2.0	16.4	15.2	14.8
136	7.81	9.2	8.7	15.9	16.3	2.3	16.4	17.7	15.6
137	11.32	6.9	9.0	16.2	14.8	2.7	16.2	15.6	16.0
138	71.66	8.5	8.9	15.7	16.8	2.8	15.5	17.6	16.6

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
64AL5	56BA	G,XN	NOX	THR- 34	C	34	THR-I	6-	DST	
68OK3	56BA137	G,P	ABY	THR- 20	C	20	ACT-I		4PI	

LANTHANUM Z=57

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
138	8.9(-2)	7.	6.0	13.7	13.9	2.3	16.6	13.0	15.0
139	99.91	8.8	6.2	13.2	16.0	2.1	16.	14.8	15.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	57LA139	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
69BE7	57LA139	G,G	LFT	6	D	6	D		DST	6.413 MEV
67HU1	57LA139	G,N	ABX	9- 11	D	9- 11	BF3-I		4PI	
68BE5	57LA139	G,N	ABX	THR- 30	D	7- 30	MOD-I		4PI	
68JU1	57LA139	G,N	NOX	THR- 27	C	27	THR-I	5-	DST	
68BE5	57LA139	G,2N	ABX	THR- 30	D	7- 30	MOD-I		4PI	
68BE5	57LA139	G,3N	ABX	THR- 30	D	7- 30	MOD-I		4PI	

CERIUM Z=58

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
136	0.19	10.	7.	16.0	13.8	.6	17.7	16.9	12.3
138	0.25	9.	7.	16.	14.7	1.2	17.3	16.8	13.1
140	88.48	9.0	8.0	16.	15.0	1.4	16.6	16.8	14.2
142	11.07	7.2	8.9	12.1	14.4	-1.4	12.6	15.7	15.9

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	58CE	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
69BE6	58CE	G,N	ABX	8- 23	D	8- 30	MOD-I		4PI	
69BE6	58CE	G,2N	ABX	12- 30	D	8- 30	MOD-I		4PI	
69BE6	58CE	G,3N	ABX	24- 30	D	8- 30	MOD-I		4PI	
68SH4	58CE140	E,P	SPC	13- 30	D	30	MAG-D	5- 15	90	ANALOG STATES
68OK2	58CE140	G,N	ABY	THR- 20	C	20	ACT-I		4PI	ISOMERIC YIELD

PRASEODYMIUM Z=59

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
141	100.00	9.4	5.2	13.3	14.3	1.	17.1	14.3	13.2

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	59PR141	G,G	RLX	5- 10	D	5- 10	NAI-D	5- 10	135	
68MO1	59PR141	$ G,G	NOX	7	D	7	NAI-D	5- 8	90	POLARIMETER 7.632
69MI1	59PR141	G,G	SPC	6- 8	D	6- 8	SCD-D	4- 8	DST	
59DI1	59PR141	G,N	RLY	9- 30	C	30	ACT-I		4PI	REL CU63 (G,N)
66BR1	59PR141	G,N	ABX	THR- 33	D	8- 33	BF3-I		4PI	
66CO3	59PR141	G,N	ABX	THR- 65	C	THR- 70	ACT-I		4PI	
67CA1	59PR141	G,N	RLX	9- 17	C	9- 17	ACT-I		4PI	
67HU1	59PR141	G,N	ABX	10, 11	D	10, 11	BF3-I		4PI	
68CA1	59PR141	G,N	ABX	9- 17	C	9- 17	ACT-I		4PI	
68JU1	59PR141	G,N	NOX	THR- 30	C	30-	THR-I	5-	DST	
66BR1	59PR141	G,2N	ABX	THR- 30	D	8- 33	BF3-I		4PI	
66BR1	59PR141	G,3N	ABX	THR- 30	D	8- 33	BF3-I		4PI	
69EJ1	59PR141	P,G	ABX	15	D	9- 11	SCI-D	6- 15	DST	15=14.95 MEV

NEODYMIUM Z=60

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
142	27.11	9.8	7.2	15.8	13.8	0.7	17.7	16.6	12.5
143	12.17	6.1	7.5	14.2	10.8	0.7	15.9	13.4	13.1
144	23.85	7.8	8.0	12.7	13.2	-1.9	13.9	15.3	13.7
145	8.30	5.7	7.9	12.6	11.8	-1.6	13.6	13.8	14.4
146	17.22	7.6	8.6	12.8	14.2	-1.2	13.3	15.5	15.0
148	5.73	7.3	9.	12.7	15.	-0.6	12.	16.1	*
150	5.62	7.3	*	13.	*	0.3	12.3	16.	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
66BE3	60ND	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
68OK2	60ND142	G,N	ABY	THR- 20	C 20	ACT-I		4PI	ISOMERIC YIELD
69ME3	60ND144	G,G	LFT	2, 2	C 2, 2	SCD-D		DST	B(EL),2.074, 2.186
69VA2	60ND148	G,XN	ABX	8- 23	C 8- 23	BF3-I		4PI	
69VA2	60ND150	G,XN	ABX	8- 23	C 8- 23	BF3-I		4PI	

SAMARIUM Z=62

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
144	3.09	10.5	6.4	16.3	12.6	0.	*	16.2	10.5
147	14.97	6.3	7.1	12.	10.4	-2.3	14.8	13.4	12.4
148	11.24	8.1	7.6	13.0	12.8	-2.0	14.5	15.3	13.0
149	13.83	5.8	7.5	12.6	11.1	-1.9	14.0	13.5	13.5
150	7.44	8.0	8.3	12.9	13.8	-1.5	13.8	15.5	14.2
152	26.72	8.2	8.6	13.6	15.3	-0.3	13.8	16.5	15.6
154	22.71	7.9	8.9	13.9	16.3	1.1	13.8	16.	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
69BE6	62SM	G,N	ABX	7- 21	D 7- 27	MOD-I		4PI	
69BE6	62SM	G,2N	ABX	13- 25	D 7- 27	MOD-I		4PI	
69BE6	62SM	G,3N	ABX	23- 27	D 7- 27	MOD-I		4PI	
66BE3	62SM144	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
59DI1	62SM144	G,N	RLY	11- 30	C 22, 30	ACT-I		4PI	REL CU63 (G,N) E
65ME1	62SM148	G,G	LFT	1	D 1	NAI-D		DST	1=1.46 MEV
69VA2	62SM150	G,XN	ABX	8- 23	C 8- 23	BF3-I		4PI	
65ME1	62SM152	G,G	LFT	1	D 1	NAI-D		105	1=0.96 MEV
67BE4	62SM152	G,G	LFT	1	D 1	NAI-D		120	1=0.963 MEV
68TA2	62SM152	G,G	LFT	1	D 1	NAI-D	1	90	1=0.963 MEV
69VA2	62SM152	G,XN	ABX	8- 23	C 8- 23	BF3-I		4PI	
69MO1	62SM154	E,F	ABX	THR-999	D 60-999	TRK-I		DST	999=1 GEV
69VA2	62SM154	G,XN	ABX	8- 23	C 8- 23	BF3-I		4PI	
69MO1	62SM154	G,F	ABX	THR-999	C 60-999	TRK-I		DST	999=1 GEV

EUROPIUM Z=63

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
151	47.82	7.9	4.9	10.2	12.7	-2.0	14.4	12.9	13.1
153	52.18	8.5	5.9	11.2	14.7	-0.3	14.8	14.2	14.5

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67HU1	63EU	G,N	ABX	9- 11	D	9- 11	BF3-I		4PI	
66AT1	63EU153	G,G	LFT	1	D	1	SCD-D	1		1=97 KEV
69BE8	63EU153	G,N	ABX	8- 29	D	8- 29	BF3-I		4PI	INCLUDES NP
69BE8	63EU153	G,2N	ABX	8- 29	D	8- 29	BF3-I		4PI	INCLUDES 2NP
69BE8	63EU153	G,3N	ABX	8- 29	D	8- 29	BF3-I		4PI	

GADOLINIUM Z=64

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
152	0.20	8.	7.3	13.3	12.5	-2.2	15.0	15.3	12.2
154	2.15	8.6	7.6	13.9	14.0	-1.0	15.1	16.2	13.5
155	14.73	6.4	7.6	14.1	12.2	-0.1	15.1	14.1	14.0
156	20.47	8.5	8.0	14.1	14.8	0.2	15.0	16.2	14.7
157	15.68	6.4	8.0	14.0	13.3	0.6	14.9	14.4	15.2
158	24.87	7.9	8.4	13.8	15.4	0.7	14.3	16.0	15.9
160	21.90	6.1	*	13.3	*	0.9	13.3	16.1	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BA3	64GD155	G,G	LFT	1	D	1	NAI-D	1		60, 86.5 KEV
66ST1	64GD155	G,G	LFT	1	D	1	NAI-D	1		1=60 KEV
69BE8	64GD160	G,N	ABX	8- 29	D	8- 29	BF3-I		4PI	INCLUDES NP
69BE8	64GD160	G,2N	ABX	8- 29	D	8- 29	BF3-I		4PI	INCLUDES 2NP
69BE8	64GD160	G,3N	ABX	8- 29	D	8- 29	BF3-I		4PI	

TERBIUM Z=65

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
156	5.2(-2)	10.	7.	14.	12.7	-1.4	16.5	16.	11.8
159	99.95	8.2	6.2	12.0	14.4	0.2	14.9	14.2	14.6

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66AT2	65TB159	G,G	LFT	1	D	1	SCD-D		DST	1=58 KEV
66RA1	65TB159	G,G	LFT	1	D	1	NAI-D		DST	1=363, 580 KEV
68BE5	65TB159	G,N	ABX	THR- 30	D	7- 30	MOD-I		4PI	
68OK2	65TB159	G,N	ABY	THR- 20	C	20	ACT-I		4PI	ISOMERIC YIELD
68BE5	65TB159	G,2N	ABX	THR- 30	D	7- 30	MOD-I		4PI	
68BE5	65TB159	G,3N	ABX	THR- 30	D	7- 30	MOD-I		4PI	

DYSPROSIUM Z=66

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
156	5.2(-2)	7.1	*	12.9	*	0.6	12.8	15.8	*
158	9.0(-2)	9.	6.9	14.	13.3	-0.8	15.7	16.	12.5
160	2.29	8.6	7.4	13.9	13.8	-0.4	15.4	15.6	13.6
161	18.88	6.4	7.5	13.6	12.3	-0.3	15.0	13.9	14.0
162	25.53	8.2	8.0	13.6	14.5	0.0	14.6	15.7	14.9
163	24.97	6.2	8.3	13.4	13.4	0.2	14.5	14.3	15.5
164	28.18	7.7	8.5	13.4	15.4	0.5	13.9	16.0	16.

NO DATA

HOLMIUM Z=67

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
165	100.00	8.0	6.1	11.6	14.	-0.2	14.6	13.8	14.7

REF	NUCLIDE Z A		REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	MIN-MAX	ANG	REMARKS
66AX1	67HO165		G,G	ABX	13, 16	D 13, 16	NAI-D		DST	
66AX1	67HO165		G,N	ABX	8- 20	D 8- 20	BF3-I		4PI	
67GE2	67HO165		G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67HU1	67HO165		G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
68BE5	67HO165		G,N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
69BE8	67HO165		G,N	ABX	8- 29	D 8- 29	BF3-I		4PI	INCLUDES NP
66AX1	67HO165		G,2N	ABX	8- 20	D 8- 20	BF3-I		4PI	
67HA1	67HO165		G,2N	RLX	14- 29	C 14- 29	ACT-I		4PI	YIELD TO ISOMERE
68BE5	67HO165		G,2N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
69BE8	67HO165		G,2N	ABX	8- 29	D 8- 29	BF3-I		4PI	INCLUDES 2NP
68BE5	67HO165		G,3N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
69BE8	67HO165		G,3N	ABX	8- 29	D 8- 29	BF3-I		4PI	
65AM1	67HO165	$	G,XN	ABY	10- 20	C 10- 20	BF3-I		4PI	ORIENTED TARGET
69KE2	67HO165	$	G,XN	ABX	10- 21	D 10- 21	BF3-I		4PI	ORIENTED TARGET
66SC1	67HO165		G,P	SPC	THR- 70	C 70	TEL-D	6- 14	DST	
66SC1	67HO165		G,D	RLY	THR- 70	C 70	TEL-D	6- 14	DST	
66SC1	67HO165		G,T	RLY	THR- 70	C 70	TEL-D	6- 14	DST	

ERBIUM Z=68

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
162	0.14	9.	6.	14.	12.2	-1.5	*	15.4	11.3
164	1.56	8.8	6.8	14.	12.8	-1.3	15.6	15.2	12.3
166	33.41	8.5	7.4	13.5	13.5	-0.8	15.2	15.5	13.5
167	22.94	6.4	7.5	13.4	12.3	-0.6	15.0	13.9	14.3
168	27.07	7.8	8.0	13.1	14.4	-0.5	14.2	15.3	15.0
170	14.88	7.2	8.5	12.7	*	-0.1	13.2	15.7	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
69BE6	68ER	G,N	ABX	7- 21	D 7- 28	MOD-I	4PI	
69BE6	68ER	G,2N	ABX	13- 27	D 7- 28	MOD-I	4PI	
69BE6	68ER	G,3N	ABX	23- 28	D 7- 28	MOD-I	4PI	

THULIUM Z=69

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
169	100.00	8.0	5.6	12.8	13.2	-1.1	15.	13.4	13.5

NO DATA

YTTERBIUM Z=70

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
168	0.14	9.	6.	13.	11.8	-2.1	15.9	14.8	11.0
170	3.03	8.	6.6	13.	12.2	-2.0	15.3	14.7	12.1
171	14.31	6.8	6.9	12.9	11.2	-1.6	15.	13.4	12.9
172	21.82	8.1	7.4	13.0	13.3	-1.3	14.9	15.1	13.8
173	16.13	6.5	7.6	11.4	12.4	-0.8	14.6	14.0	14.6
174	31.84	7.4	8.0	12.9	14.4	-0.5	13.9	15.1	15.1
176	12.73	6.6	8.	12.0	*	-0.7	12.5	12.7	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
69MO1	70YB174	E,F	ABX	THR-999	D 60-999	TRK-I	DST	999=1 GEV
69MO1	70YB174	G,F	ABX	THR-999	C 60-999	TRK-I	DST	999=1 GEV

LUTETIUM Z=71

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
175	97.41	7.8	5.5	11.0	12.8	-1.4	14.4	13.0	13.5
176	2.59	6.1	5.9	10.7	12.0	-1.6	14.0	11.7	13.9

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
69BE6	71LU	G,N	ABX	7- 24	D 7- 28	MOD-I		4PI	
69BE6	71LU	G,2N	ABX	14- 28	D 7- 28	MOD-I		4PI	
69BE6	71LU	G,3N	ABX	24- 28	D 7- 28	MOD-I		4PI	

HAFNIUM Z=72

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
174	0.18	*	5.8	13.	11.3	-2.6	*	14.4	10.9
176	5.20	8.	6.4	12.4	11.7	-2.4	15.0	14.3	11.9
177	18.50	6.4	6.6	12.1	10.6	-2.5	14.	12.8	12.5
178	27.14	7.6	7.3	11.9	12.4	-2.4	14.0	14.2	13.5
179	13.75	6.1	7.5	11.8	11.8	-2.1	13.7	13.4	14.0
180	35.24	7.3	7.9	12.2	13.6	-1.4	13.4	14.9	15.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67MI1	72HF	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67RA2	72HF	G,F	ABX	THR-260	C200-260	EMU-I		4PI	
61HA1	72HF177	G,G	LFT	0- 1	D 0- 1	NAI-D	0- 1	110	113, 321 KEV

TANTALUM Z=73

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
180	1.2(-2)	6.8	5.9	11.1	11.6	-2.1	14.6	12.0	13.4
181	99.99	7.6	6.2	11.1	13.3	-1.4	14.4	13.5	14.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
59BA3	73TA181	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI	
65HE1	73TA181	E,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
68BO1	73TA181	E,F	ABI		D250,500	EMU-I		4PI	
65HE1	73TA181	E+,N	RLY	THR- 32	D 14- 32	ACT-I		4PI	
67SH3	73TA181	G,G/	ABX	18	D 18	NAI-D	0- 18	90	RAMAN SCATTERING
67GE2	73TA181	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67HU1	73TA181	G,N	ABX	8- 11	D 8- 11	BF3-I		4PI	
68BE5	73TA181	G,N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
68KA1	73TA181	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
68VE1	73TA181	G,N	ABX	THR- 36	D 7- 36	MOD-I		4PI	
69TS1	73TA181	G,N	NOX	15- 26	C 26	SCI-D	7	DST	
68BE5	73TA181	G,2N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
68VE1	73TA181	G,2N	ABX	THR- 36	D 7- 36	MOD-I		4PI	
68BE5	73TA181	G,3N	ABX	THR- 30	D 7- 30	MOD-I		4PI	
68VE1	73TA181	G,3N	ABX	THR- 36	D 7- 36	MOD-I		4PI	
68BE5	73TA181	G,4N	ABX	THR- 36	D 7- 36	MOD-I		4PI	
68VE1	73TA181	G,4N	ABX	THR- 36	D 7- 36	MOD-I		4PI	
64AL5	73TA181	G,XN	NOX	THR- 34	C 34	THR-I	6-	DST	
66FI2	73TA181	G,XN	SPC	THR- 60	C 60	TOF-D	5- 40	90	
67AN2	73TA181	G,XN	ABX	THR- 20	C 8- 20	BF3-I		4PI	
69IS1	73TA181	G,XN	ABX	7- 30	C 7- 30	MOD-I		4PI	
67MI1	73TA181	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67RA2	73TA181	G,F	ABX	THR-260	C200-260	EMU-I		4PI	

TUNGSTEN (WOLFRAM) Z=74

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
180	0.14	*	6.5	12.8	11.6	-2.6	*	14.4	11.7
182	26.41	8.0	7.0	13.0	12.8	-1.7	14.9	14.7	13.2
183	14.40	6.2	7.1	12.4	11.7	-1.6	14.2	13.2	13.4
184	30.64	7.4	7.7	12.1	13.1	-1.5	13.6	14.6	14.3
186	28.41	7.2	8.3	12.2	14.4	-1.1	13.0	15.0	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	74W	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
64DE4	74W	G,F	ABX	300-999	C300-999	EMU-D	300-999	4PI	
66SH2	74W 183	G,G	LFT	1	D 1	NAI-D	1	4PI	1=46,48 KEV
69BE8	74W 186	G,N	ABX	8- 29	D 8- 29	BF3-I		4PI	INCLUDES NP
69BE8	74W 186	G,2N	ABX	8- 29	D 8- 29	BF3-I		4PI	INCLUDES 2NP
69BE8	74W 186	G,3N	ABX	8- 29	D 8- 29	BF3-I		4PI	

RHENIUM Z=75

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
185	37.07	8.	5.4	10.5	12.2	-2.3	14.	12.9	13.1
187	62.93	7.3	6.0	10.5	13.2	-1.6	13.5	13.2	14.3

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
67MI1	75RE	G,F	ABX	300-999	300-999	TRK-I		999=1600 MEV
67RA2	75RE	G,F	ABX	THR-260	C200-260	EMU-I	4PI	
67ME1	75RE185	G,G	LFT	0- 1	D 0- 1	SCD-D 0- 1	DST	646,718,874 KEV
64LA3	75RE187	G,G	LFT	0- 1	D 0- 1	NAI-D	DST	5 LEVELS
64SH5	75RE187	G,G	LFT	1	D 1	NAI-D	122	1=686 KEV
67LA2	75RE187	G,G	LFT	0- 1	D 0- 1	SCD-D		8 LEVELS

OSMIUM Z=76

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
184	0.02	*	6.0	*	10.7	2.9	*	14.1	10.4
186	1.59	8.3	6.5	13.0	11.6	2.8	15.1	14.4	11.9
187	1.64	6.3	6.5	12.0	10.5	2.7	14.5	12.8	12.4
188	13.3	7.8	7.1	12.1	12.5	2.3	14.1	14.4	13.0
189	16.1	6.0	7.3	11.9	11.3	2.0	13.8	13.1	13.6
190	26.4	7.8	8.0	12.4	13.7	1.5	13.8	15.1	14.8
192	41.0	7.6	*	13.0	*	0.0	13.5	15.9	*

REF	NUCLIDE Z A	REACTION-RES IN,OUT		EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
67RA2	76OS	G,F	ABX	THR-260	C200-260	EMU-I	4PI	
67MI1	76OS	G,F	ABX	300-999	300-999	TRK-I		999=1600 MEV

IRIDIUM Z=77

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
191	37.3	8.2	5.4	10.7	12.8	-2.0	14.5	13.2	13.4
193	62.7	7.8	5.8	10.9	14.0	-1.0	13.9	13.5	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE MIN-MAX	ANG	REMARKS
67SC1	77IR191	G,G	LFT	0- 1	D 0- 1	SCD-D 0- 1	125	539,588 KEV
68DA1	77IR191 $	G,G	NOX	1	D 1	NAI-D	DST	MAG MOMENT,129 KEV
67ME2	77IR193	G,G	LFT	0- 1	D 0- 1	SCD-D 0- 1	105	460,557,559 KEV

PLATINUM Z=78

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
190	1.3(-2)	9.	6.	13.	11.1	-3.2	15.9	14.6	11.0
192	0.78	8.	6.8	13.	12.3	-2.3	15.0	15.1	12.2
194	32.9	8.4	7.6	13.0	13.3	-1.4	14.7	15.4	13.4
195	33.8	6.1	7.6	12.9	11.8	-1.2	14.5	13.7	14.0
196	25.3	7.9	8.1	13.1	14.2	-0.8	14.0	15.5	14.8
198	7.21	7.6	8.8	13.1	15.1	0.0	13.4	15.7	*

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66BE3	78PT	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
68JU1	78PT	G,N	NOX	THR- 27	C 27	THR-I	5-	DST	
67MI1	78PT	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67RA2	78PT	G,F	ABX	THR-260	C100-260	EMU-I		DST	

GOLD Z=79

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
197	100.00	8.1	5.8	11.4	13.6	-0.9	14.8	13.8	14.0

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67GE2	79AU197	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67HU1	79AU197	G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
69DE1	79AU197	G,N	ABY	THR-999	C 1- 6	ACT-I		4PI	999=5.5 GEV
69DI1	79AU197	G,N	ABY	THR-900	C400-900	ACT-I		4PI	
65HA2	79AU197	G,A	SPC	THR- 31	C 31	EMU-D	5- 20	DST	
65ME2	79AU197	G,A	SPC	THR- 35	C 35	SCD-D	5- 26	90	
67MI1	79AU197	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67RA2	79AU197	G,F	ABX	THR-260	C100-260	EMU-I		DST	

MERCURY Z=80

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
196	0.15	9.	6.6	13.	12.4	-1.9	16.	15.0	11.7
198	10.02	8.6	7.1	13.4	13.1	-1.3	15.3	15.2	12.9
199	16.84	6.6	7.2	13.3	11.8	-0.8	15.3	13.8	13.7
200	23.13	8.0	7.7	13.3	14.0	-0.7	14.7	15.3	14.2
201	13.22	6.2	7.6	13.0	12.7	-0.3	14.2	14.0	14.8
202	29.80	7.8	8.5	13.2	14.9	-0.1	14.0	15.4	15.
204	6.85	7.5	9.	13.5	16.1	1.	13.5	16.	*

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
66BE3	80HG	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
69RA1	80HG	G,G	NOX	5	D 5	NAI-D		DST	5=4.906 MEV
69BO3	80HG199	G,G	ABX	0- 2	C 0- 2	ACT-I		4PI	
68OK3	80HG199	G,P	ABY	THR- 20	C 20	ACT-I		4PI	
69CA2	80HG201	G,MU-T	ABX	0	D 0	SCI-D	0		0=32.2 KEV, J-PI

THALLIUM Z=81

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
203	29.5	7.7	5.7	11.2	13.4	-0.9	14.6	13.5	14.2
205	70.5	7.5	6.4	11.4	15.	0.0	14.2	14.0	15.

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS	
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX			
66BE3	81TL	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135		
68KA1	81TL	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC	
65MO2	81TL	G,XN	ABX	10-110	C 16-110	ACT-I		4PI		
67MI1	81TL	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV	
67PA1	81TL203	G,G	LFT	1	D 1	NAI-D	1	110	1=279 KEV	
56HE2	81TL203	G,N	RLY	THR- 31	C 31	ACT-I		4PI	REL CU63	E
56HE2	81TL203	G,A	RLY	THR- 31	C 31	ACT-I		4PI	REL NEUTRONS	E
69MO2	81TL205	G,G	LFT	7	D 7	SCD-D	0- 9	DST	7=7.646	
69RA1	81TL205	G,G	LFT	8	D 8	NAI-D		DST	8=7.647 MEV	
57EL2	81TL205	G,A	ABX	THR- 32	C 32	ACT-I		4PI		E

LEAD Z=82

A	ABUND.(1)	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
204	1.48	8.2	6.6	12.8	12.4	-2.0	15.2	14.4	12.3
206	23.6	8.1	7.3	13.0	13.4	-1.1	14.8	14.8	13.7
207	22.6	6.7	7.5	13.0	12.7	-0.4	14.8	14.0	14.9
208	52.3	7.4	8.0	12.9	14.5	-0.5	14.1	14.9	15.4

(1) ABUNDANCE DEPENDS ON SOURCE

REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS
	Z A	IN,OUT			MIN-MAX	TYPE	MIN-MAX		
59BA3	82PB	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI	
59PA3	82PB	G,G	ABX	17	D 15, 18	NAI-D	17	90	
65GI1	82PB	G,G	LFT	8	D 5- 8	NAI-D	3- 8	135	8=7.28 MEV
66DE1	82PB	G,G	RLX	12- 17	D 12- 17	NAI-D		DST	
67GE2	82PB	G,N	ABY	THR- 27	C 22, 27	BF3-I		4PI	
67HU2	82PB	G,N	ABY	THR- 22	C 22	THR-I	4-	DST	
68JU1	82PB	G,N	NOX	THR- 22	C 22	THR-I	5-	DST	
68KA1	82PB	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
69TS1	82PB	G,N	NOX	14- 26	C 26	SCD-D	7	DST	
64AL5	82PB	G,XN	NOX	THR- 34	C 34	THR-I	6-	DST	
68MC1	82PB	G,XN	NOX	THR- 32	C 22- 32	THR-I	5-	DST	
68TO1	82PB	G,XN	ABX	10- 24	C 10- 24	BF3-I		4PI	MONTR CALIBRATION
67MI1	82PB	G,F	ABX	300-999	300-999	FRG-I		DST	999=1600 MEV
67RA2	82PB	G,F	ABX	THR-260	C100-260	EMU-I		DST	
66BE1	82PB	N,G	SPC	14	D 7	NAI-D	8- 18		
66ZI2	82PB206	E,E/	RLX	3	D 28- 70	MAG-D		DST	B(EL) 3=2.6 MEV
68ZI1	82PB206	E,E/	FMF	2- 5	D 28- 73	MAG-D	28- 73	100	B(EL) 3 LEVELS
66BE3	82PB206	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
67HU1	82PB206	G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
69BO1	82PB206	G,N	SPC	THR- 10	C 8- 10	TOF-D		135	G-WIDTH
69VE1	82PB206	G,XN	SPC	THR- 33	C 33	TOF-D	0- 14	DST	ENRICHED PB206
66ZI2	82PB207	E,E/	RLX	3	D 28- 70	MAG-D		DST	B(EL) 3=2.62,2.66
68ZI1	82PB207	E,E/	FMF	2- 5	D 28- 73	MAG-D	28- 73	100	5 LEVELS
66DE2	82PB207	G,N	SPC	THR- 80	C 80	CCH-D	0- 15	135	
69BO1	82PB207	G,N	SPC	THR- 9	C 7- 9	TOF-D		135	G-WIDTH
69BO4	82PB207	G,N	ABX	THR- 8	C 9	TOF-D	A-B	135	A-B 25-350 KEV
70BO1	82PB207	G,N	ABX	THR- 8	C 9	TOF-D		135	ERRATUM FOR 69BO4
66PE1	82PB208	E,E/	FMF	0- 6	D 70	MAG-D		130	
66ZI2	82PB208	E,E/	RLX	3	D 28- 70	MAG-D		DST	B(EL) 3=2.615 MEV
68ZI1	82PB208	E,E/	FMF	2- 7	D 28- 73	MAG-D	28- 73	100	7 LEVELS
69MO1	82PB208	E,F	ABX	THR-999	D 60-999	TRK-I		DST	999=1 GEV
68KA3	82PB208	G,MU-T	LFT	7	D 7	NAI-D	7		7=7.277 MEV
65MC1	82PB208	G,G	LFT	7	D 7	NAI-D		DST	7=7.28 MEV
66BE3	82PB208	G,G	RLX	7	D 5- 10	NAI-D	5- 10	135	7=7.28 MEV
66DO1	82PB208	G,G	LFT	7	D 7	NAI-D		DST	7=7.297 MEV
67DO1	82PB208	G,G	LFT	7	D 7	NAI-D		DST	ERRATUM FOR 66DO1
67GI1	82PB208	G,G	LFT	7	D 6- 8	NAI-D	4- 8	DST	7=7.28 MEV
67ST1	82PB208	G,G	LFT	7	D 7	NAI-D	4- 7	135	7=7.28 MEV
68MO1	82PB208	G,G	NOX	7	D 7	NAI-D	5- 8	90	POLARIMETER 7.28
69RA1	82PB208	G,G	LFT	8	D 8	NAI-D		DST	8=7.277 MEV

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
67HU1	82PB208	G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
69BO1	82PB208	G,N	SPC	THR- 10	C 7- 10	TOF-D		135	G-WIDTH
69BO4	82PB208	G,N	ABX	THR- 8	C 9	TOF-D	A-B	135	A-B 25-350 KEV
70BO1	82PB208	G,N	ABX	THR- 8	C 9	TOF-D		135	ERRATUM FOR 69BO4
68GO3	82PB208	G,XN	ABX	THR- 22	CTHR- 22	BF3-I		4PI	
69VE1	82PB208	G,XN	SPC	THR- 33	C 33	TOF-D	0- 14	DST	ENRICHED PB208
69MO1	82PB208	G,F	ABX	THR-999	C 60-999	TRK-I		DST	999=1 GEV

BISMUTH Z=83

A	ABUND.	G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
		SEPARATION ENERGIES (MEV)							
209	100.00	7.4	3.8	9.4	10.9	-3.1	14.3	11.2	11.8

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX	DETECTOR TYPE	DETECTOR MIN-MAX	ANG	REMARKS
66ZI2	83BI209	E,E/	RLX	2- 3	D 28- 70	MAG-D		DST	B(EL) 2.58, 2.73
68ZI1	83BI209	E,E/	FMF	2	D 28- 73	MAG-D	28- 73	100	B(EL) 2.6 MEV
68BA2	83BI209	E,F	ABX	THR-999	D200-999	FRG-I		4PI	999=1.5 GEV
68BO1	83BI209	E,F	ABI	THR-500	D250,500	EMU-I		4PI	
69MO1	83BI209	E,F	ABX	THR-999	D 60-999	TRK-I		DST	999=1 GEV
66BE3	83BI209	G,G	RLX	5- 10	D 5- 10	NAI-D	5- 10	135	
66DE1	83BI209	G,G	RLX	12- 17	D 12- 17	NAI-D		DST	
67GI1	83BI209	G,G	LFT	7	D 6- 8	NAI-D	4- 8	DST	7=7.15 MEV
69BE7	83BI209	G,G	LFT	7	D 7	D		DST	7.15 MEV
69CE1	83BI209	G,G	NOX	6- 8	D 6- 8	SCD-D	0- 8	DST	
69ME2	83BI209	G,G	LFT	2- 3	C 3	SCD-D		127	2.563, 2.581,2.598
69RA1	83BI209	G,G	LFT	8, 8	D 8, 8	NAI-D		DST	8,8=7.416, 7.149
66BE4	83BI209	G,N	ABX	7	C 11	TOF-D		135	
66DE2	83BI209	G,N	SPC	THR- 80	CTHR- 80	CCH-D	0- 15	135	
67HU1	83BI209	G,N	ABX	9- 11	D 9- 11	BF3-I		4PI	
67KU1	83BI209	G,N	SPC	12- 16	D 12- 16	TOF	0- 8	115	
68KA1	83BI209	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC
68LE1	83BI209	G,N	SPC	7- 20	C 20	EMU-D	0- 13	DST	
69TS1	83BI209	G,N	NOX	15- 26	C 26	SCI-D	7	DST	
67WY1	83BI209	G,3N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,4N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,5N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,6N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,7N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,8N	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,9N	RLI	THR-137	C137	ACT-I		4PI	
64AL5	83BI209	G,XN	NOX	THR- 34	C 34	THR-I	6-	DST	
67AN2	83BI209	G,XN	ABX	THR- 20	C 8- 20	BF3-I		4PI	
69VE1	83BI209	G,XN	SPC	THR- 33	C 33	TOF-D	0- 14	DST	
67WY1	83BI209	G,4NP	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,5NP	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,6NP	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,7NP	RLI	THR-137	C137	ACT-I		4PI	
67WY1	83BI209	G,8NP	RLI	THR-137	C137	ACT-I		4PI	
69MO1	83BI209	G,F	ABX	THR-999	C 60-999	TRK-I		DST	999=1 GEV
64DE4	83BI209	G,F	ABX	300-999	C300-999	EMU-D	300-999	4PI	
67MI1	83BI209	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67MI1	83BI209	G,F	ABX	300-999	300-999	TRK-I			999=1600 MEV
67RA2	83BI209	G,F	ABX	THR-260	C100-260	EMU-I		DST	
66BE1	83BI210	N,G	SPC	11	D 7	NAI-D	8- 18		

RADIUM Z = 88

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 A      ABUND.              SEPARATION ENERGIES (MEV)
                  G,N      G,P      G,T     G,HE3     G,A     G,2N     G,NP     G,2P
226               6.4      6.9      9.7       *      -4.9    11.3     13.7       *


REF     NUCLIDE REACTION-RES  EXCIT    SOURCE    DETECTOR   ANG  REMARKS
         Z    A   IN,OUT                MIN-MAX TYPE MIN-MAX

68ZH1   88RA226   G,F     RLY THR- 25 C  9- 25 TRK-I         DST
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THORIUM Z=90

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 A      ABUND.              SEPARATION ENERGIES (MEV)
                  G,N      G,P      G,T     G,HE3     G,A     G,2N     G,NP     G,2P
232     100.00    6.4      7.7     10.        *      -4.1    11.4     14.        *


REF     NUCLIDE REACTION RES  EXCIT    SOURCE    DETECTOR   ANG  REMARKS
         Z    A   IN,OUT                MIN-MAX TYPE MIN-MAX

69WA1   90TH      G,F     RLX   0-999 C200-999 SCD-D         DST 999=1.2 GEV

58KA2   90TH232   G,F     ABX   5- 18 C  5- 18 ION-I         DST
59BA4   90TH232   G,F     RLY THR- 20 C  6- 20 ION-I         DST                    E
65AL1   90TH232   G,F     RLX   2-  7 D  6-  7 EMU-D         DST
65CA3   90TH232   G,F     ABY 300-100 C  1     EMU-I         4PI
65SA1   90TH232   G,F     SPC THR-  8 C  8     TOF-D  1-  8 DST
65SO1   90TH232   G,F     RLX   6-  7 D  6-  7               DST TRACKS IN GLASS
68RA1   90TH232   G,F     NOX THR-  8 C  5-  8 FRG-I         DST
69KA1   90TH232   G,F     ABX THR-  8 C  5-  8 TRK-I         DST
69MA2   90TH232   G,F     ABX   5-  9 D  5-  9 EMU-I         4PI
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URANIUM Z=92

A	ABUND.	SEPARATION ENERGIES (MEV)							
		G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
234	5.6(-3)	6.8	6.6	10.3	10.6	-4.8	12.7	13.3	12.0
235	0.72	5.3	6.7	10.0	9.5	-4.7	12.0	11.9	12.3
238	99.27	6.1	7.6	10.0	*	-4.3	11.4	14.0	*

REF	NUCLIDE		REACTION	RES	EXCIT	SOURCE	DETECTOR		ANG	REMARKS	
	Z	A	IN,OUT			MIN-MAX	TYPE	MIN-MAX			
69WA1	92U		G,F	RLX	0-999	C200-999	SCD-D		DST	999=1.2 GEV	
58KA2	92U	233	G,F	ABX	5- 18	C 5- 18	ION-I		DST		
59BA4	92U	233	G,F	RLY	THR- 20	C 6- 20	ION-I		DST		E
59BA4	92U	234	G,F	RLY	THR- 20	C 6- 20	ION-I		DST		E
59BA4	92U	235	G,F	RLY	THR- 20	C 6- 20	ION-I		DST		E
66KO3	92U	235	G,F	RLY	THR- 25	C 10- 25	ACT-I		4PI		
68PE2	92U	235	G,F	NOX	THR- 25	C 25	ION-D		4PI		
59BA4	92U	236	G,F	RLY	THR- 20	C 6- 20	ION-I		DST		E
67RA3	92U	238	E,F	RLX	THR-260	D 25-260	EMU-I		4PI		
68BO1	92U	238	E,F	ABI	THR- 40	D250,500	EMU-I		DST		
69MO1	92U	238	E,F	ABX	THR-999	D 60-999	TRK-I		DST	999=1 GEV	
59BA3	92U	238	E,N	ABY	THR- 36	D 10- 36	BF3-I		4PI		
68KA1	92U	238	G,N	ABX	50- 85	C 55, 85	TOF-D	10- 85	67	NEUT ENGY SPEC	
69DE1	92U	238	G,N	ABY	THR-999	C 1- 6	ACT-I		4PI	999=5.5 GEV	
55KA1	92U	238	G,F	ABX	THR- 26	C 12- 26	ACT-I		4PI		E
55LA2	92U	238	G,F	RLY	THR- 19	C 19	BF3-I		4PI	DELAYED NEUT	E
56KO2	92U	238	G,F	ABX	8- 24	C 8- 24	ION-I				E
56KO3	92U	238	G,F	SPC	THR- 18	C 18	ION-D	50-100	4PI		E
57BA4	92U	238	G,F	NOX	THR- 27	C 9- 27	EMU-D		DST		E
57SC2	92U	238	G,F	RLY	THR- 15	C 4- 16	ACT-I		4PI		E
58BA7	92U	238	G,F	NOX	THR- 27	C 6- 27	EMU-I		DST		E
58KA2	92U	238	G,F	ABX	5- 18	C 5- 18	ION-I		DST		
59BA4	92U	238	G,F	RLY	THR- 20	C 6- 20	ION-I		DST		E
60PR2	92U	238	G,F	NOX	7	D 7	BF3-I		4PI	SOURCE F19(P,AG)	
65AL1	92U	238	G,F	RLX	6- 7	D 6- 7	EMU-D		DST		
65CA3	92U	238	G,F	ABY	300-999	C999	EMU-I		4PI	999=1 GEV	
65HO1	92U	238	G,F	RLY	THR- 33	C 33	SCD-D	100-200	90	MASS SPC	
65HO2	92U	238	G,F	NOX	7	D 7	SCI-I		4PI	SOURCE F19(P,AG)	
65KI1	92U	238	G,F	ABY	6- 7	C 5- 7	ACT-I		4PI		
65MA3	92U	238	G,F	ABX	5- 8	D 5- 8	EMU-D		4PI		
65NI1	92U	238	G,F	RLY	THR- 15	C 10- 15	BF3-I		4PI		
65SO1	92U	238	G,F	RLX	6- 7	D 6- 7	TRK-I		DST	TRACKS IN GLASS	
65SO2	92U	238	G,F	NOX	THR- 9	C 5- 9	EMU-I		DST		
66BO1	92U	238	G,F	NOX	THR- 9	C 5- 9	TRK-I		DST	TRACKS IN GLASS	
66MA3	92U	238	G,F	ABX	5- 9	D 5- 9	EMU-I		DST		
66ME2	92U	238	G,F	ABY	17	D 17	ACT-I		4PI	SOURCE LI7(P,G)	
66SA1	92U	238	G,F	RLY	THR-650	C650	ACT-I		4PI		
67KA1	92U	238	G,F	RLY	THR- 7	C 5- 7	ACT-I		4PI		
67RA3	92U	238	G,F	RLX	THR-260	C 25-260	EMU-I		4PI		
68KU1	92U	238	G,F	ABY	THR- 7	C 4- 7	ACT-I		4PI		
68RA1	92U	238	G,F	NOX	THR- 8	C 5- 8	FRG-I		DST		
69KA1	92U	238	G,F	ABX	THR- 8	C 5- 8	TRK-I		DST		
69MA1	92U	238	G,F	ABX	5- 9	D 5- 9	EMU-I		DST	N-CAPTURE G'S	
69MO1	92U	238	G,F	ABX	THR-999	C 60-999	TRK-I		DST	999=1 GEV	

NEPTUNIUM Z = 93

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
237		6.7	5.0	8.3	10.5	-5.0	12.4	11.5	12.1

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX TYPE	DETECTOR MIN-MAX	ANG	REMARKS	
58KA2	93NP237	G,F	ABX	5- 18	C 5- 18	ION-I	DST		
59BA4	93NP237	G,F	RLY	THR- 20	C 6- 20	ION-I	DST		E

PLUTONIUM Z = 94

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
238		6.9	5.9	9.9	9.7	-5.6	12.9	12.6	11.0
239		5.6	6.1	9.8	8.9	-5.2	12.6	11.5	11.3
240		6.4	6.4	9.5	10.0	-5.2	12.1	12.5	11.7
242		5.4	6.7	9.5	10.8	-5.1	11.9	11.8	12.3

REF	NUCLIDE Z A	REACTION IN,OUT	RES	EXCIT	SOURCE MIN-MAX TYPE	DETECTOR MIN-MAX	ANG	REMARKS	
69KA1	94PU238	G,F	ABX	THR- 8	C 5- 8	TRK-I	DST		
58KA2	94PU239	G,F	ABX	5- 18	C 5- 18	ION-I	DST		
59BA4	94PU239	G,F	RLY	THR- 20	C 6- 20	ION-I	DST		E
66RA2	94PU239	G,F	NOX	5- 7	C 5- 8		DST		
68RA1	94PU239	G,F	NOX	THR- 8	C 5, 8	FRG-I	DST		
59BA4	94PU240	G,F	RLY	THR- 20	C 6- 20	ION-I	DST		E
68RA1	94PU240	G,F	NOX	THR- 8	C 5, 8	FRG-I	DST		
69KA1	94PU240	G,F	ABX	THR- 8	C 5- 8	TRK-I	DST		
68RA1	94PU242	G,F	NOX	THR- 8	C 5, 8	FRG-I	DST		
69KA1	94PU242	G,F	ABX	THR- 8	C 5- 8	TRK-I	DST		

AMERICIUM Z = 95

A	ABUND.	SEPARATION ENERGIES (MEV) G,N	G,P	G,T	G,HE3	G,A	G,2N	G,NP	G,2P
241		6.7	4.6	8.2	9.5	-5.6	12.7	11.1	11.0

	Z A	IN,OUT			MIN-MAX TYPE	MIN-MAX			
REF	NUCLIDE	REACTION	RES	EXCIT	SOURCE	DETECTOR	ANG	REMARKS	
58KA2	95AM241	G,F	ABX	5- 18	C 5- 18	ION-I	DST		
59BA4	95AM241	G,F	RLY	THR- 20	C 6- 20	ION-I	DST		E

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